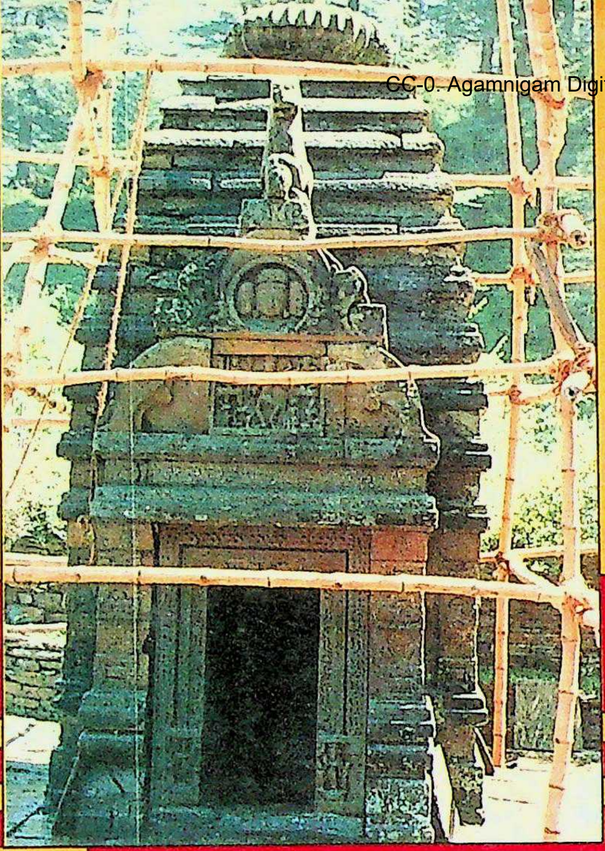

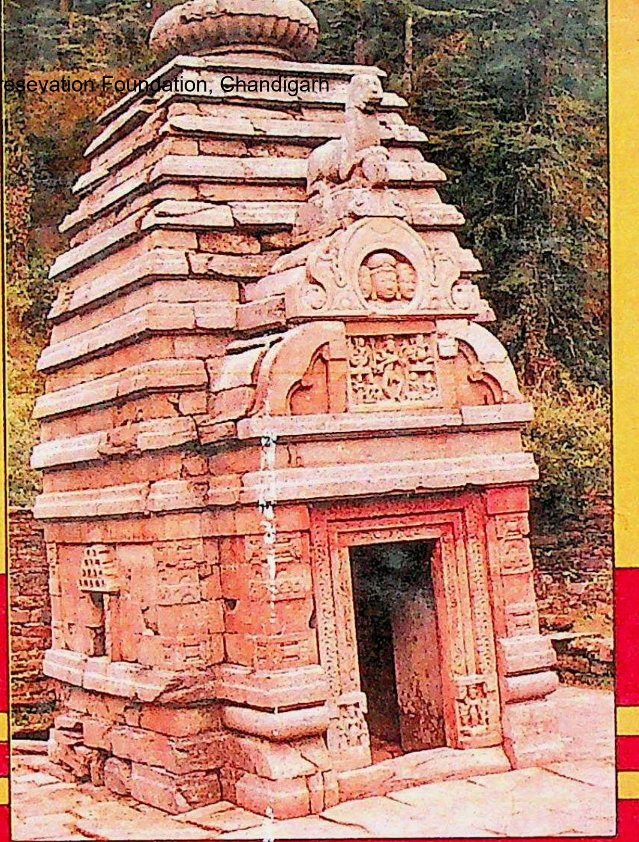

PROTECTION CONSERVATION AND PRESERVATION OF INDIAN MONUMENTS

S.L. Nagar

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Protection, Conservation and Preservation of Indian Monuments

SHANTI LAL NAGAR

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Dedicated
to
K.M. Srivastava

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New Delhi

SHANTI LAL NAGAR

Contents

Preface ix

List of Figures xv

List of Plates xv

List of Colour Plates xvi

Chapter 1 **Introduction** **1**

Chapter 2 **Structural Conservation : A Background** **14**

- (i) Retaining of the original character of monuments during conservation, genesis of the concept
- (ii) Archaeological conservation with the advent of British rule in India
- (iii) Archaeological Conservation––definition of

Chapter 3 **Building Materials** **20**

Evidence of Texts, wood, combination of wood and mud-bricks, stone, burnt bricks, combination of burnt and unburnt bricks, stone masonry, lime mortar/plaster, *Vajralepa* or plaster for smooth surface, the painting material, use of dowels/bolts and clamps, polish on stone.

Chapter 4 **Structural Repairs, Reconstruction and Transplantation** **32**

Causes for decay—(i) natural causes, (ii) man-made causes; Inspection Notes; Precautions needed during conservation; Conservation of execavated sites/structures and trenches; Reconstruction or Transplantation, Documentation; Dismantling of structures; Transportation, stack-yard, reconstruction.

Chapter 5 **Environmental Development** **50**

- (i) Soil erosion and safeguards (ii) Development of Forestry, Horticulture, Botany and Floriculture in India;
  - (a) Genesis and Evolution: Literary Evidence: *Rigveda, Atharvaveda, Upanishads,* Epics:- *Ramayana* and *Mahabharata*; other Sanskrit works like, *Meghadutam Malvikagnimitra, Raghuvamsa, Kumarsambhavam, Abhijnanasakuntalam, Malatimadhava, Uttararamacharita, Kiratarjuniyam, Venisamhara, Nala Damyanti, Nagananda, Uttarapurana.*
  - (b) Archaeological Evidence:- Harappan Culture, Asokan Pillars, Bharhut, Sanchi and Amaravati Stupas, Kushana and Gupta Structures; Medieval edifices: Mughal gardens laid by Babur, Humayun, Akbar, Jahangir, Shah Jahan and Aurangzeb;

(c) Archaeological Gardens in modern times;
(d) Arrangement of gardens at archaeological sites.

Chapter 6 **Antiquarian Laws** **70**
(i) Glimpses of ancient Antiquarian Laws/Rules, (ii) Temples under the charge of garrisons or places of refuge, (iii) Protection notice boards, (iv) Modern Antiquarian Laws, (v) National Register of Antiquities--Data Bank, (vi) Institutions exempted from registration of Antiquities, (vii) Protection of Environments, (viii) Environmental Development, (ix) Monuments of National importance, (x) Prohibition of public functions at monuments, (xi) Vandalism or theft of Antiquities, (xii) Checks against smuggling of Antiquities at sea and airports, (xiii) UNESCO convention.

Chapter 7 **Chemical Conservation** **90**
Introductory; Chemical treatment of Materials and Monuments; Inorganic Materials; Stone in Indian Monuments and other art objects.

Chapter 8 **Epilogue** **118**

Appendices **121**
I Chronological Development of the concept of Conservation of Ancient Monuments in India.
II Chart showing the definition of Treasure or Antiquity.
III Extract from Bengal Regulation, XIX of 1810
IV Extract from Madras Regulation, VII of 1817
V Extract from Religious Endowment Act, 1863
VI Extract from Indian Treasure Trove Act, 1878
VII Extract from section 33(i) & (j) of Estate Duty Act, 1953
VIII Extract from sections 5(i), (xii) and (xiii) of the Wealth Tax Act, 1957
IX Extract from Section 11 of Arms Act, 1959
X Extract from Income Tax Act, 1961
XI Extract from Custom's Act, 1962
XII Extract from Custom's Act, 1962
XIII Chart showing definition of Monuments
XIV List showing Trees mentioned in the *Mahabharata*
XV List of Tree and Plants mentioned in the Varaha and the -*Vamana Puranas*
XVI Trees and Plants patronised in the Mughal gardens

Bibliography **149**

Preface

उच्छिष्टे नाम रूपं चेच्छिष्टे लोक आहितः ।
उच्छिष्टे इन्द्राश्चाग्निश्च विश्वमन्तः समाहितम् ।।
उच्छिष्टे द्यावाप्रथिवी विश्वं भूतं समाहितम् ।
आपः समुद्र उच्छिष्टे चन्द्रमा रात आहितः ।।

(Name and Form are in the Residue. The world is in the Residue, Indra and Agni are in the Residue. The universe is in the Residue. Heaven and Earth, all existence is in the Residue. The water, the ocean, the moon and the wind are in the Residue.)

Atharvaveda, XI. 9.1-2

Pṛithvi, the element and Earth goddess (*Bhu*) yields her surface. It is the earth which serves as a field for architectural ritual, since it is the realm of manifestation and of bodily existence; indeed it is said to be the place where the mortals reside (*Vās*). The ancients, who were experts in various fields of architecture, considered *Bhūmi*, the ground; *Prāsāda*, the temple a palace or a dwelling house; *Yana* or conveyance; and *Śayana*, the couch as the four essential elements of architecture. Of these *Pṛithvi* the earth is considered to be the main *Vastu* for it is the underlying stratum of existence. The *Prāsādas*, temples or the houses besides other works of architecture originate therefrom, because they are *Vastu* (existing things).

The materials used for the construction of monumental edifices in the ancient past were:

(i) Wood, bamboo, reed, hay,
(ii) Brick (Burnt clay), brick ballast,
(iii) Clay or mud bricks,
(iv) Stones of various types,
(v) Stucco,

(vi) Iron,
(vii) Copper,
(viii) Lime or lime concrete,
(ix) Wattle and daub,
(x) Mud, used for bricks, walls or houses,
(xi) Cut-blocks of *kankar*.

Persons engaged for the execution of construction and repair works included:

(i) Architect,
(ii) Mason/*Sthāpati*,
(iii) Stone cutter or stone carver,
(iv) Blacksmith,
(v) Engraver,
(vi) Carpenter or wood carver,
(vii) Other Artisans,
(viii) Metal caster, and
(ix) Sculptor.

All these were expected to be highly skilled professionals well versed in the canons of architecture and provisions in the scriptures for designing and construction of monumental edifices.

The texts also provide that the artisans engaged on any important enterprise should be honoured suitably with all available means. This indirectly alludes to the fact that the workers, though engaged on some specific projects were not only suitably rewarded, but the services, rendered by them were acknowledged; there are numerous instances wherein their names were engraved alongwith the donor, on the edifices so built.

Besides construction of the monumental edifices, their maintenance, repair and upkeep was also an important duty evolved on the keepers of these edifices or the priesthood.

The present concept of maintaining the original character of the monuments has not been adequately defined, though in actual practice, some of the monuments were repaired quite frequently in the remote past maintaining their original character. Some of the wooden temples in Chamba and Kulu come under this category. In general, evidence for carrying out repairs to the existing edifices is abundantly available. In several cases, during later period, edifices were built one after the other over the remains of the earlier ones, using the serviceable material of the earlier structures. A careful peep into some of the Buddhist monasteries in the country, point to the fact that some of them were repaired in quick succession or rebuilt one over the other, and layers of each one of these structures are distinctly visible. Needless to say the serviceable material of the earlier structure was never discarded, but was used freely without any reservation.

An interesting aspect of the ancient edifices, is the use of stucco for plastering of the walls and other surfaces. Stucco is a kind of plaster used for surfacing inside or outside walls, moulding relief ornaments. The stucco work was done in the caves of Ajanta, Ellora, Elephanta, Bagh and several other Buddhist establishments of the bygone days, creating masterpieces in frescoes and even statues. The use of stucco is still in vogue in some of the Buddhist monasteries in Himachal Pradesh and Ladakh. While it would be difficult to spell out the methodology used in the repair of the stucco figures or the fresco paintings in the past, but, in the monasteries of Ladakh, there is still prevalent a tradition of patronising the artisans, who handle superbly the restoration of the damaged portions of the paintings by using indigenous material. They have their own ways and means of producing the colours used originally in such work.

The environmental development of the monumental edifices is another important aspect, which goes a long way in protecting them from decay. This can be achieved in two ways, viz. (i) improving the surrounding of the edifices to enhance their architectural appeal or (ii) to save them from climatic and other natural forces and pollutants. The monuments located at seashore, hill regions, and the desert areas, where extreme climatic changes occur frequently, need such development, the shore temple at Mahabalipuram, Sun temple at Konark and the like can be cited as examples. These monuments are exposed to the danger of not only soil erosion but also of sea breeze which is injurious to stone structures; these need special measures for their preservation.

The conservation, maintenance and protection of the cultural heritage in India is in the Concurrent List as per the Indian Constitution. While the centrally protected monuments are looked after by the Central Government, those of local or lesser importance are attended to by the respective states. While considering the question of their annual repairs and upkeep, the following factors have to be kept in mind.

i) Most of these monuments are located in remote and far-flung localities and away from human habitation.

ii) For carrying out repairs or renovation works at these monuments, the required material, in a majority of the cases has to be transported from outside and over long distances.
iii) Similar is the case of skilled labour, which too has to be transported at times.
iv) The use of heavy machinery like bull-dozers, dumpers, etc. has to be avoided as the likelihood of causing damage to the structure, which was erected centuries earlier, cannot be completely overruled.

Beautification of the monumental edifices was known in India from quite an early date. In the early texts flora is repeatedly described, by the terms *Vanaspatis* or *Aushadhis*. One of the Rigvedic *richas* says: शांन्तिवर्नस्पत्थाः. The *Bṛihatsamhita* (LV.8) records that gods always play near groves, rivers, mountains and springs and in towers with pleasure gardens––

वनोपान्तनदीशैलनि झरोपान्तभूमिपु ।
रमन्ते देवता नित्यं पुरेषूद्यानवत्सु च ।।

The same expression is available in *Bhavishya Purāṇa* (I, 133.15).

Another conspicuous contribution of the ancient Indian literature is to equate high personages with huge trees. As for example, in the *Rāmāyaṇa*, the sage Vālmiki compares Rāma, the hero of the epic, with a huge Banyan tree whose flower and fruit is Sītā, Sugriva, Jāmbavanta, Kumud, Nala, Nila, Dvida, Mainda Angada, Hanumāna, Sushena and all other monkeys and commanders of Rama's army were the branches of the same tree:

राम वृक्षं वनें हन्मि सीता पुष्पफल प्रदम् ।
प्रशाखा यस्य सुग्रीवो जाम्भवान कुमुदो नलः ।।
द्विविदश्चैव मैन्दश्च अंगदो गन्धमादनः ।
हनूमांश्च सुषेणश्च सर्वे च हरि यूथपा : ।।

Rāmāyaṇa, 6.99-4.

Even Ravana was compared with a huge tree which had his patience as its leaves, his adament nature as its beautiful flowers, and his *tapas* as its strength and his stubborn nature as its trunk. The wind of Rama uprooted even such a huge and mighty tree:-

धृति प्रवालः प्रसमाग्र्य पुष्यस्तेपोवलः शौर्यः निबंद्धमूलः ।
रणे महान् राक्षसराज वृक्षः सम्मर्दितो राधव मारूतेन ।।

Ramayana, 6.109-9.

Following the footsteps of Vālmiki, Vyāsa too compared both Yudhishithira and Duryodhana, the heroes of the *Mahābhārata*, with huge trees:

दुर्योधनो मन्यु मयो महाद्रुमः स्कन्धकर्णः शकुनिस्तस्य शाखा ।
दुःशासन फलपुष्पै समृद्ध मूलं राजाधृतराष्ट्रौडमनीषी ।।
युधिष्ठिरो धर्ममयो महाद्रुम : स्कन्धोर्जुनां भीमसेनोस्य शाखा ।
माद्री सुतौ पुष्पफले समृद्धे मूलं कृष्णों बहन च ब्राहमणश्च ।।

Mahabharata, Adiparvan, 1.110-111.

Ancient literature refers also to different types of forests, gardens or parks which include:-

i) *Vana* (forest), a dense wood or a jungle.
ii) *Upavana*, a small forest, grove or a garden.
iii) *Vātika*, a park laid with flowers.
iv) *Udyana*, a park, a garden or a royal garden
v) *Araṇya*, a forest full of wild growth.

The terms mentioned above in no way fit in relation to the modern development of horticultural activities around the monumental edifices, which include temples, mosques, tombs, churches, stupas, monasteries, pleasure places or palaces or other royal buildings and forts.

Groves had a special reference to the life of the Buddha who was born under an Asoka tree and then attained enlightenment under a Buddhi tree, a sapling of which was sent to Sri Lanka during the time of Asoka. Besides the Jetavana Vihara was the popular abode of the Buddha during his life time. Indeed flora and fauna were immensely popular with the Buddhists from the earliest times, for which evidence is available in the gateways of Sanchi and Bharhut, besides Amaravati and other Buddist sites. Other archaeological evidence testifies to existence of gardens in the Gupta period and the period that followed. But with the coming of the Mughals into power in Delhi, horticulture in the country received a great boost, and many gardens were developed under their patronage particularly in Agra, Delhi, and other places.

Chemical treatment of the monuments is another important aspect, which goes a long way in the preservation of monumental edifices. By this method, the deterioration of the vestiges of the past can be treated against decay by natural causes like exposure to sun, rain, snow, or sea breeze. The structures located near the sea coast get mainly affected by these causes. The monuments at Mahabalipuram, the temple at Konarak as well as the temples located in the coastal belt of Orissa could be mentioned particularly in this connection. The longivity of such monuments has been increased by chemical treatment. Besides, it is on record that the world renowned frescos of Ajȧnta, Ellora, Bagh and other places owe their preservation to the chemical treatment given by the experts. The chemical treatment of the group of temples at Khajuraho, not only protected them from wild growth, but also removed the thick coat of accumulated soot. Thus the scientific treatment of the monumental edifices by use of chemicals and chemical preservatives has its own importance and the results achieved by these means are at times astounding.

In all the works of structural conservation, chemicals preservation or even the horticulture works undertaken for the preservation of monumental edifices, it is the conservator or field worker who actually executes the works which are of quite challenging or complex nature. He indeed deserves a word of appreciation. In the ancient literature he has been termed superman though the modern field worker has yet to achieve the qualities described therein. The texts adore the *Vastupurusa* thus:-

ॐ नमो भगवते वास्तुपुरूषाय महावल पराक्रमाय सर्वाधवाश्रित

शरीराय ब्रह्मपुत्राय सकल ब्रहमाण्ड धारिणे भूभारार्पित मस्तकाय

पुरपत्तन प्रासादगृह वापिसरः कूपादेः सन्निवेश सानिध्यकराय

सर्वसिद्धि प्रदाय प्रसन्न वदनाय विश्वंभराय परमपुरूषाय

शक्रवरदाय वास्तोष्पते नमस्ते ।

"Om, I bow to the holy *Vāstupurusa* of great strength and valour whose body rests under all dwellings, son of Brahma, upholder of the entire universe, whose head is placed to carry the burden of earth, who makes all sites (receptacles) of his presence. The towns and cities, temples (and palaces), houses tanks and wells, who assures all kinds of fulfilment, of gracious appearance, Support of cosmos. Supreme *Purusha*, Granter of boons to Indra, Lord of dwellings, obeisance."

Pauranik vastusantiprayoga, Fol.25.

New Delhi

SHANTI LAL NAGAR

List of Figures

1. Carved stone disc from Rupar, showing a lady standing in front of a leave's hut, under a tree; 600 B.C.
2. Base of lion capital from Lohangi fort, Vidisha, showing geese carrying lotus stalks in their beaks, Asokan period.
3. Panel from Sanchi gateway showing the forest scene, with snakes and animals; 1st century B.C.
4. Panel from Sanchi gateway showing a garden scene; 1st century B.C.
5. Panel from Sanchi gateway showing a garden scene, 1st century B.C.
6. Panel from Bharhut showing Gajalakshmi standing over a lotus and an elephant standing on lotus on either side pouring water over the Goddess 2nd century B.C.

List of Plates

1. Panel from Bharhut showing Gaja Lakshmi standing over a lotus, with an elephant on either side standing on lotus, pouring water over the goddess; Bharhut, 2nd century B.C.
2. Stone slab showing the fullblown lotuses, Red Fort, Delhi, Early Medieval.
3. Terracotta plaque showing Matsyavatar of Vishnu, holding lotus with a lotus bud, Asutosh Museum, Early Medieval.
4. Ganesa dancing under a tree full of fruites (mango), Kesava temple, Somanathapur, Medieval period.
5. Mahishasuramardini standing in *alidha* posture under the branches of a mango tree. Kesava temple, Somanathpur, Mysore, Medieval period.
6. Mahishasuramardini standing in *pratyalidha* posture under a mango tree, Nuggahalli, Mysore, Medieval period.
7. Fresco from Akal-Takht, Amritsar.

List of Colour Plates

1. Marble *Jali* work with flowery pattern at Dargah of Salim Chisti, Fatehpur Sikri, Agra. 16th century A.D.
2. Inlay work in the tomb of Khusro, Allahabad, 16 century A.D.
3. Marble *Jali* work in the tomb of I'tmad-ud-Daula, Agra.
4-6. Inlay work in the tomb of I'tmad-ud-Daula, Agra, showing Cypress.
7. Inlay work in the tomb of I'tmad-ud-Daula, showing flowers and birds, Agra.
8. Inlay work in the tomb of I'tmad-ud-Daula, showing flowers in a flower-vase fish-design, Agra.
9,10. Inlay work on the graves in the Taj, Agra.
11-13. Flower patterns at Naubat-khana, Red Fort, Delhi.
14,15. Goden inlay work at Diwani-khas, Red-Fort, Delhi.
16. Inlay work at Diwani-Khas, Red Fort, Delhi.
17,18. Flora and fauna on the walls of Moti Masjid, Red Fort, Delhi.
19-21. Inlay work at Moti Masjid, Red Fort Delhi, showing flowers.
22-25. Decorated interior of the Dally Jesus Church, Daman.
26. Siva and Parvati standing under a tree, Narbadesvara temple, Tirasujanpur.
27,28. Paintings from Hazardwari Palace, Mushidabbad
29. Royal Palace, Patiala

1

Introduction

India is a country with a rich cultural heritage in the form of ancient monumental edifices comprising of palaces, forts, stupas, monasteries, rock-cut caves, decorated with world-renowned murals, besides sculptures, bronzes, terracottas and wooden objects, etc. Some of these vestiges of the past are outstanding specimens of global art representing different periods/schools of art and architecture and are scattered all over the country.

The construction of these edifices was based on tradition, and canons of religious art and architecture so abundantly available in the country from the earliest times. These texts had in fact been influencing artists and artisans of earlier ages in the carving of images and of building shrines, forts, etc. besides their repair and restoration. Some of the texts describe the ways and means to restore and repair old and damaged shrines, besides replacement of the broken, decayed and defiled images or other cult objects. Some of the texts, however, declare that the repair and restoration of old images are great acts of religious merit.[1] "In some texts these are even described as more meritorious than the establishment of new shrines and construction of new images"[2].

Thus the builders of religious edifices not only attended to the construction of new shrines, but also paid equal importance to the repair, restoration or preservation of the existing remains of religious art in the country. These remains of the past were built not only in populous river valleys and in the midst of snowclad mountainous regions of the Himalayas, but also in the coastal regions of Bengal, Kerala, Tamil Nadu; even the deserts of Rajasthan could boast of possessing many such edifices. At times the conservators have to face considerable inconvenience and insurmountable difficulties in the conservation as well as preservation of these monuments, because of their inaccessible location, approachable by treks through serpentine roads passing through dark and deep awe-inspiring ravines, gorges, and the burning heat of Rajasthan deserts, where sand and dust storms are of daily occurrence.

In order to embark on the subject of the causes for the decay and deterioration of the vestiges of the past, it would be quite prudent to know the stuff or material with which they were built. The popular building materials of those bygone days are:

1. Stone of different varieties.
2. Burnt bricks of different sizes.
3. Mud or clay.
4. Wood, etc.

The factors responsible for the decay of these monumental edifices, are natural as well as man-made, some of which are detailed hereunder:-

(a) Natural Causes

(i) Exposure to sun, rain and other climatic effects of the past centuries.
(ii) Earthquakes which on occasions shatter the very foundations of the structures.
(iii) Erosion of soil due to rain and floods.
(iv) Extreme weather conditions, as in Himalayan regions, where the monuments have to face subzero temperature, icy winds, hail storms and remain buried under snow for long.
(v) Geographical situation like sea coast or deserts; for example Mahabalipurm and Konarak, where the sea waves and breeze have caused immense damage to the monuments; in Jaisalmer sand storms have eroded the facades of buildings.
(vi) Air pollution, here the monuments are affected constantly by smoke emitting factories, refineries, railway yards and other sources emitting pollutants.
(vii) White ants and termites which adversely affect wood work.
(viii) Dampness and seepage of water due to the location of the monuments near river banks, lakes, and areas of heavy rainfall.

(b) Man-made causes

(i) Surface vibrations caused by quarrying operations near the monuments, railway yards or railway lines, air strips or air fields, or operation of heavy machinery in the factories in the vicinity of the monumental edifices.

(ii) Neglect of the monuments for centuries, leaving them uncared for without maintenance.
(iii) Human misuse, when the monuments are used for residential or other commercial purposes.
(iv) Air or ground attacks during war or other military operations.
(v) Vandalism.

Of the above factors responsible for the damage or decay of the cultural heritage in the country, those listed under the second category, i.e. the "Man-made" ones are more serious, as these cause quick irrepairable damage. A recent and the far more damaging factor is the large number of visitors to the monuments who unconsciously damage them by scrapping or inserting their names on them as a mark to commemorate their visit; others steal away a fragment of an edifice just to carry it as a memento of their visit to the shrine. (The author himself saw a Buddhist monk from Sri Lanka removing stealthily a big chunk of the plaster from the main stupa at Sanchi, for taking it to his country as a mark of his visit to the sacred place.) Such cases are not uncommon at other monuments in the country. But the most deplorable acts of vandalism are committed by smugglers and anti-social elements at the monuments; for they break parts of these edifices and clandestinely export them to other countries.

The foundation of any monument supports two kinds of loads imposed on it; DEAD LOAD, i.e., the total weight of the monument and its fittings; LIVE LOAD, i.e. the number of persons who use the monument, the furniture, etc. There is a limit to the latter. For example the Taj Mahal is a royal funerary monument. It would have been designed to carry a live load of say 50 persons, care-taker staff daily and on occasions say 200 persons. Belonging to the imperial family, the question of tens of thousands of visitors daily to the Taj Mahal during Mughal Rule would not arise. Now this edifice has to bear such live-loads never dreamt of before. No wonder it deteriorates day by day.

For the preservation of the ancient monumental edifices, therefore, protective measures, side by side with the use of preservatives are absolutely necessary, because even when the monuments are well preserved, these measures are a must to save them from human vandalism, which none can say shall not occur; nature caused decay which can be set right, but man caused destruction sometimes is difficult to repair.

Since most of the edifices were constructed on the basis of the Silpa Sastras or the science of architecture, it would be of interest to note, what these texts have to say about the repairs, renovation or restoration of the vestiges of the past. The texts give more details about the restoration of the broken parts of the images or idols in particular, besides describing the ill effects resulting from the adoration of the damaged images of the deities.

(i) The Texts

According to *Śilparatna* Part-II, p. 206 "when an image is slightly damaged, it should never be discarded; but when its arms, hands, feet and legs are severed, when it is broken, split up or nine *yava* portion of it is gone, or when it gets disfigured, it is usually to be discarded. If its fingers, etc. are cut or broken the sages recommend binding or repairing them. In fact Chapter XXXIX of this text describes in detail the methodology to be used in the repair of images. Almost identical provisions for the repair and restoration of images, etc. are available in *Agni Purāṇa* and other Puranic texts, besides the *Mānasāra*. The *Pratimālakshaṇam* text provides for removal of the ill effects and the disposal of the damaged images of the deities in quite an elaborate manner:

दग्धा जीर्णा च भग्ना च स्फुरिता चापि देवता ।
स्थिता व स्थाप्यमाना व सदा दोष करा भवेत् ।।
दग्धामर्चा अनावृष्टि जीर्णामर्चा धनक्षयम् ।
भग्नामर्चा कुले नाशं स्फुरितां युद्धमाविशेत् ।।
अर्चावा यदि वा लिङ्ग देवी मातृगणस्तथा ।
शीघ्र मङ्गग्येदेव विधि दृष्टेन कर्मणा ।।

(The image of deity, if it be burnt, worn-out, broken or split up, after its establishment or at the time of its enshrinement, will always be harmful. A burnt image brings forth draught, a worn-out one causes loss of wealth, a broken image forebodes death in the family, while one that is split up brings war. Be it an image or be it the phallic emblem of Śiva, whether the images be those of goddesses or Divine Mothers,—all of them should be raised (or removed from the sanctum) according to the rites laid down by canons.)

The text further prescribes that after giving oblations of flowers, incense, food and sacrificial offerings and clothes, after duly performing the sacrificial rites, (the householder or the donor of the above type of images), should have the ceremony of propitiatory water performed according to Vedic *mantras*. If the image is made of stone it should be immersed in the sacred water of rivers or in the confluence of rivers. If the images are made of gold, silver or copper/brass, then all of them should be melted in fire, if one desires one's own welfare. If the image is of wood, then it should be covered with new cloth and after having been coated with clarified butter and honey, it should be put into blazing fire. In case the image is made of earth then a pit should be dug into the ground in which the image is to be deposited and then covered with earth.

The *Śukranīti* deals with both architectural and sculptural objects. In this text structural details are given along with interesting description of forts and fortified towns, of temples and other types of buildings and various sorts of images. Repair of broken images, for instance, is an important matter which has been dealt with in detail in this treatise.

(ii) Terminology

These religious texts, besides serving as the basis of religious art and architecture also provide a mine of information about the artists, artisans, *sthāpitis* and other skilled workers or technicians. These sources also spell out the terminology used for different types of repair, restoration, renovation or even chemical treatment of the edifices. These aspects are discussed[3] hereunder:-

(a) Khaṇḍa Jīrṇoddhāra

This includes repair, renovation, restoration of fallen parts or those which are damaged, mutilated and decayed.

(b) Sphutita

The removal of soot due to application of oil and growth of moss.

(c) Khaṇḍa Sphutita-Navakarma

Repairing, renovating and restoration of the portions which are mutilated or have developed various types of accretions or adding new or more artistic beauty come under this category.

(d) Navakarma

This could be taken to mean providing additions and alterations to the existing structures, or complete renovation of an edifice.

(e) Sphuta or Sphutita Navakarma

This could be taken to mean the repairing of distorted portions of edifices and restoring them to their original shape. The distortion may be due to overloading, sinking due to sub-soil movement, etc.

(f) Nava Sudha Karma

The term was used for colour or lime washing. The term used in South India for the purpose was "*Soda-Sunna*"—*Soda* means white, *Sunna* means lime.

(g) Tarugulma Nirmali Karma

Besides removal of vegetation, the clearance of jungle was one of the other important items which frequently find mention in the texts. This included removal of over-growth, vegetation, unnecessary trees and wild plants. This term was mainly used in south India.

(iii) The Artisans

While discussing about the conservation works carried out in the past at the religious and other ancient edifices, it would be of interest to know about the artists, field workers, architects, artisans and other skilled workers engaged for purposes of designing, engraving and sculpturing, etc. Some[4] of them are:

(a) *Viśvakarmā* — an engineer, who could plan and supervise the execution, construction or renovation, etc.
(b) *Śilpi* — a sculptor who could prepare excellent sculptures.
(c) *Ruvarai* — an artist who could execute decorative motifs on any surface like stone, wood, etc.
(d) *Voja* — an engraver who could engrave with exquisite clarity and finish an inscription on any surface.

(iv) Qualities of an Artist or an Artisan

For the construction of prestigious works like temples and other edifices, it was necessary to engage qualified technicians and other skilled workers. These people who formed a caste by themselves were expected to apply their talents and immutable principles of art codified in the texts in the execution of the assigned jobs. *Śilpa-Śāstra* is quite explicit in this regard. These workers were expected not only to be well versed in their respective professions and skill, but also to have good grounding in the religious texts, which they had to translate into concrete form. The *Samarāṅgana-Sūtradhāra* prescribes the following indispensible traits for a good artist:

(a) power of intuitive contemplation or meditation (*prajña*),
(b) power of careful observation,
(c) technical skill through long practice,
(d) adept in the science of meters and balance.
(e) knowledge of anatomy of animals, birds and humans, both moving and stationary as well as under the influence of diverse passions.
(f) *pratyutpannamati*—ready intelligence.
(g) self control and high character.

The rewards and honours to the artists or artisans engaged on the execution of building and other works of art have been touched already *vide* preface. The occupation of these workers was hereditary in general and the skill was passed on from father to son.[5]

In fact, a *Sthāpati* was not only well versed in the *sastras* (i.e. the science of architecture, the traditional lore as handed down from generation to generation and expounded by the ancient *Acharyas* like Visvakarma, Maya, Garga, Kasyapa and Manasara, etc.) but also an expert builder and a skilled craftsman in all arts. Again mere practical experience and artistic perfection were not enough; he should have personal insight and the genius of an architect. This is very important, because at times the Śāstric canons and practical experience were all of no avail and his personal intuition or preception alone came to his rescue. Apart from these three qualifications, an architect must be a man of character above reproach both in precept and practice. Such a well equipped person alone could be a real *Sthāpati*.

(v) The Finances

The finances for the execution of varied types of works of art, and conservation and maintenance of religious and other edifices in ancient times, usually came from:

(i) royal or individual donations,
(ii) revenue earned out of the landed and other properties attached to these edifices,
(iii) endowment trusts, or
(iv) collections specially raised for the purpose..

These sources of revenue have been described in numerous epigraphical records. In addition to these, there are instances where these edifices were restored, renovated or repaired by raising public loans, remission of land revenues or other taxes levied by the State. An inscription from Srirangam in Thiruchirapalli district records that in the second regnal year of the king, there was a clash between the right hand and left hand communities, in which the village was burnt down, the sacred places destroyed and images of deities and the treasury of the temple were looted by robbers. As the village had to be rehabilitated, the temple had to be renovated and reconstructed and new walls had to be built for the *Prākāra*, the village *Sabhā* took a loan of fifty *Kañjalu* of gold, the interest on which was partly used for the construction and renovation of temple and partly for making tax-free some specified land for the upkeep of the temple.[6]

Genesis of Structural Conservation

The genesis of the structural conservation of monumental edifices in the Indian subcontinent could be traced from the enlargement of a stupa of the earlier Buddha *Konakamuni* at Nigihawa in Nepal under the orders of Emperor Asoka during the fourteenth year after his coronation as recorded in an inscription. Besides it is also on record that Asoka removed the Buddha's relics from seven out of eight stupas in which they were enshrined and distributed them over to 84,000 newly built stupas. Naturally, the stupas out of which the relics were removed, were restored or rebuilt, though, it may be difficult to state at this late stage, whether these stupas were rebuilt on the original pattern or were given a new outlook or shape. The entire exercise perhaps projects the earliest evidence of the preservation of the vestiges of the past by royal decree, the cost of which being of such magnitude could naturally be borne by the royal treasury. A century later another king, Kharavela of Kalinga, undertook a series of repairs to the structures damaged due to natural causes.

An instance of *Jīrṇoddhāra*, associated with Buddhist shrine, has been recorded in the steatite relic casket discovered at Shinkot in Bajaur territory nearly 32 km. to the northwest of the confluence of Pinjkora and Swat rivers beyond the borders of the old Northwest Frontier Province (now in Pakistan). Two sets of inscriptions are engraved on it, the earlier one referring to the establishment or conservation of the corporeal relics of the Buddha in the reign of Maharaja Menandra (Menander), the donor being a person named Vijayakamitro, the *aparcharaja* ('one who has no king as his adversary'). The later portion of the record also refers to the establishment of the corporeal relics of the Buddha and of the bowl, but a person named Vijayamitra, also an *aparcharaja* and evidently a descendant of Vijayamitra, on the 25th day of Vaisakha of the fifth regnal year is also mentioned. The second epigraph records[7]:

> "The corporeal relic having been broken is not held in worship with zeal. It is decaying in course of time, (and) is not honoured; (and here) by the offering of alms and water, ancestors are no longer propitiated; (and) the receptacle of that (relic) has been cast aside. (Now) in the fifth year and on the twenty-fifth day of the month of Vaisakha, this has been established by Vijayamitra, who has no king as his adversary."

The tradition of structural conservation is further evidenced from the restoration of a bund of Sudersana lake in Junagadh (initially built during the time of Asoka) by Saka Satrap Rudradaman by about the middle of the second century A.D. Besides the well known Pasupatinatha temple at Kathmandu in Nepal, which has been an attraction for pilgrims since the sixth century A.D. onwards, witnessed successive repairs including the replacement of old wood work.

The Chinese pilgrim Hieun Tsiang,[8] who visited India in A.D. 629 testifies to the prevalance of the practice of *jīrṇoddhāra* by using old material of the earlier structure built in the first century B.C. thus,

> ". . . . in recent times Sasanka, the enemy and oppressor of Buddhism, cut down the Bodhi-tree destroyed its roots down to the water and burned what remained. A few months afterwards Purnavarma, the last decendant of Asoka on throne of Magadha, by pious efforts brought to life and in one night it became over ten feet high. This king then built round it a stone wall 24 feet high."

India, in fact, had a great tradition for the preservation of its cultural heritage. The spirit could be evidenced from the fact that in spite of repeated foreign invasions and ruthless destruction of the relics of its ancient culture, not only the rulers but the public as well as the religious heads of the respective institutions or the priesthood had shown commendable zeal in renovation, restoring or rebuilding the damaged structures. The temple of Somnath in Gujarat is an outstanding example of this fervour. No doubt the temple was destroyed in A.D. 1025 by Mahmud of Gazni, but was repaired again by Bhim Deva-I (A.D. 1022-1075) and thereafter by Siddharaja in 11th century A.D. It was again reconstructed by Kumarapala in A.D. 1169.[9] In fact this temple has a prolonged history of destruction and restoration spread over a millennium or so.

That the practice of restoration of ancient edifices was prevalent in the country, could also be ascertained from the monasteries of Nalanda, where as many as seven layers of the successive structures built over the remains of earlier buildings are visible even to this day.

Epigraphical Evidence

Among the sources highlighting the prevalance of the practices of *jīrṇoddhāra* of the monumental edifices the epigraphs play an important role. The rulers of the times evinced keen interest in providing munificent grants for the construction, preservation and restoration of religious edifices and the release of such grants was invariably recorded in the form of an epigraph, containing the royal decree. Some of the numerous examples available in epigraphical records are described below:

(1) An inscription from Adul[10] belonging to the reign of Kirti-Varman II registers the grant of land for the maintenance and upkeep of *Jinālaya* and *dānaśālā* constructed by Gemuṇḍa.

(2) The inscription of Kumara Gupta records the gift of ten Dinars for the maintenance of perpetual alms-house and simultaneously warns that "(whosoever shall interfere with this, become invested) with (the guilt of) five sins."[11]

(3) Junagadh Rock inscription of Skandạ Gupta records the restoration of the breach of Sudarsana Lake formed in the valley round the foot of Girnar mountain.[12]

(4) Gandhara stone inscription of Visva Varman (A.D. 423) records the construction of a temple of Vishṇu—also a temple of divine-mothers and a large drinking well by Mayurākshaka—a minister of Viśva Varman.[13]

(5) Mandsor stone inscription of Kumara Gupta Bandhu Varman records the restoration of a Sun temple (in A.D. 473-74) which had gone into disrepair.[14]

(6) Khoh Copper-plate inscription of Maharaja Sarvanatha records the grant by the Maharaja of half of the village of Dharavashandika for

the purpose of the maintenance of the temple Pushta-purika Devi who was none else than the goddess Laxmi—the consort of Vishṇu.[15]

(7) Nagarjuni hill cave inscription of Anant Varman records the installation of an image of the Goddess Pārvatī—consort of Śiva under the name of Kātyāyani and also the grant to the same goddess, under the name of Bhavani, of a village[16] for the maintenance of the temple.

(8) In lines 22-23 of the Gupta period inscription of 5th century A.D. found in the village Gandhar of Jhalawar, Madhya Pradesh, mention is made of the erection and maintenance of the abode of terrible *Dakinis* (Divine-Mothers) who stir up the ocean with the mighty wind rising from the tantric rites of their religion.[17]

(9) An inscription in Telugu script of A.D. 1001 from village Medidinna in Cuddapah,[18] A.P. found in the temple of Āñjaneya records the renovation of the temple and reinstallation of the deity Anjaneya to the north of the village, by one Katti Basivinayaka son of Agastesvara. An inscription in the temple at Chidipirala village in Cuddapah district of A.P. belonging to 9th-10th century A.D. in Telugu characters records the renovation of the temple said to have been built by Agastya which was ruined in course of time.[19]

(10) On a *Dīpastambha* of Mādhavaswami temple at village Chapadu in Cuddapah Distt. of Andhra Pradesh, an inscription in Telugu characters dating back to A.D. 1560 records the reconstruction of the Sikhara of the temple by Vobulyya.[20]

(11) An inscription from Konduguli (Bijapur Distt.) belonging to the reign of Chalukya Tribhuvanamaka, dating back to A.D. 1107, registers the grants for *Jirṇoddhāra* of the temple of *Jotisvaradeva*.[21]

(12) A copper plate grant of Anand Verman (15th century) from Chamba records the completion of repairs to the Śiva temple.[22]

(13) Two copper plate inscriptions issued by Raja Pratap Singh in A.D. 1582, mention that the Lakshmī Nārāyaṇa Temple at Chamba was consecrated, whereas it may be inferred that the restoration amounted to complete renovation of the temple.[23]

(14) The three-line inscription on one of the two pillars at the entrance of Vajreśwari Temple, at Chamba dating back to A.D. 1773 records the repair and renovation of the temple.[24]

(15) An inscription recording the repairs and additions to the temple of Baijanatha during the time of Raja Sansar Chand II in A.D. 1786 is

available on a small stone-slab set into the pavement (of the courtyard of the temple) leading towards the Ghat on the River Nagwal.[25]

(16) The temple of Vajreśwari in Kangra, which was ransacked by Mahmud of Gazni in A.D. 1009, is stated to have been restored in A.D. 1440.[26]

(17) The temple at Chamba was repaired by Raja Pratap Singh Verma in A.D. 1559.[27]

(18) The temple of Chamuṇḍā Devi at Chhatari was repaired by Raj Singh.[28]

(19) According to Vogel the temples at Mani-Maheśa must have been rebuilt over an older shrine, which is referred to in an inscription of Meru Varman on the stone bull placed in front of the temple.[29]

(20) The existing wooden temple of Devi at Kao must have been constructed a few centuries back, over the ruins of the earlier ones.[30]

(21) Raghunātha temple in the old Bilaspur town in Himachal Pradesh must have been rebuilt some centuries later using the sculptures of the 8th-9th century A.D. Some carvings resembling the throne of Pratihara period appear in various panels built a little above the plinth level of the temple. At the time of reconstruction, the temple is stated to have been dedicated to Śiva.[31]

(22) The temple of Bālaka Rūpi near Sujanpur, is said to have been repaired by one Gaṇeśa, a priest of Jawal Rajas, who gave up his office and took up abode in the temple.[32]

The preservation of an ancient edifices, however, will have to be viewed from the angles of structural conservation, chemical preservation and their environmental development besides its protection from vandalism and other natural and man-made forces of destruction. These aspects have been highlighted in the chapter that follows.

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2

Structural Conservation : A Background

(i) Retaining of the Original Character of Monuments During Conservation—Genesis of the Concept

Once an edifice be it religious or otherwise is built, it is necessary to maintain it properly and whenever the same is damaged or destroyed, it has to be repaired, renovated or even reconstructed for the regular use of all concerned. The idea behind renovation, repairs or reconstruction of earlier edifices, barring some exceptions, by and large appears to be to retain their original character. But this idea was seldom kept in view. For example the original plan of the Vajresvari Temple at Kangra, which was destroyed in the earthquake of 1905, does not compare with the present structure. Sometimes, however, the original character of an edifice was so changed as to suit the whims of a victorious monarch who would like to establish his superiority over the vanquished ruler by changing the earlier structures in which the parts of earlier edifices were often freely used in later renovations or repairs. In support[1] of this, the example of Śakti temple at Chhatrari (Chamba in Himachal Pradesh), could be quoted. In this temple the material of earlier structure was visibly used while renovating it. The existing entrance[2] doors of the temple once belonged to a vanished temple. (Even in the modern conservation works carried out by the Archaeological Survey of India, in the centrally protected monuments, materials like stone, etc. used earlier are freely availed of.)

The modern concept of conservation/preservation of the monuments in order to retain their original personality is witnessed in the temples of Nirmand, where according to Frankie "The roofs of the temples are sloping and slightly concave, on either side of the central beam laid with slates and wooden shingles."[3] None of the edifices according to Frankie seems to be of great age since they were always repaired in the same style as a result of which the temples at Nirmand in Kulu of the remote past, did not look different from those existing at present.

Though the genesis of the idea of maintaining the original character of the buildings appears to have been there in the remote past, but the same was not of widespread usage or application; no reference in this regard could be traced from the texts. In a number of cases the original character of the building was completely lost sight of while renovating them. The Brihadisvara temple at Tanjore which was built in A.D. 1001, completely lost its valuable fresco paintings during renovation in the 16th century, and such examples are not uncommon. In spite of the prevalence in the remote past of the idea of restoration of edifices no definite royal decree for this purpose is available; the ancient scriptures also do not stress on the same.

(ii) Archaeological Conservation with the Advent of British Rule in India

The British after their arrival, in the country in 1639, started their own constructions and architectural styles. A firm foot-hold and consolidation of their rule in the country enabled the British to take an interest in the antiquarian remains of India. In 1784 Sir William Jones set up the Royal Asiatic Society with its headquarters at Calcutta. The object of the Society was to study, cultivate and preserve the antiquities, art, sciences and literature of Asia. A chart showing the chronological development of the concept of conservation after the advent of the British on Indian horizon is available in Appendix-I.

(a) The first step towards the preservation of ancient cultural heritage was the introduction of the Bengal Code-XIX in 1810; this was followed by the Madras Code-VII in 1817. According to these enactments the Government was vested with powers to intervene, or to save any monument from misuse by private individuals. The conservation of monuments according to these legislations remained with the Management Boards specifically set up for the purpose. The upkeep of the monuments was to be managed out of the revenue earned from the landholdings, etc. attached to these monuments.

(b) In 1861, the Archaeological Survey headed by Cunningham as the Archaeological Surveyor was set up as a Central Department. Thus it was for the first time that the British Government recognised its responsibility towards the preservation of ancient monuments in the country. In spite of this step, the preservation of the monuments did not come within the purview of the newly created Department. In

1863, by Act-XX, the Government took over the authority to prevent injury to buildings remarkable for their antiquity or for their historical or architectural value and to preserve them.

(c) Unfortunately, for reasons unknown, the Government decided to abolish the Archaeological Survey in 1865, this resulted in serious set back to the cause of preservation of ancient monuments in the country.

(d) Prompted by a letter of Sir Stafford Northcote addressed privately to the Secretary of State on the need of preserving architectural remains in India, Lord Lawrence's Government issued a circular letter on 29th August, 1867 to all local Governments directing them to prepare lists of important monuments under their jurisdiction and have them photographed as well. In his communication dated 11th January, 1870, the Secretary of State advised the Government that antiquities were instructive only when they are preserved in their original context. He laid special stress on the need for conservation, and also pointed out that it was the bounden duty of the Government to prevent its own servants from accelerating the destruction or decay of its monuments.

(e) Conservation of ancient monuments was, from the very beginning, kept out of the purview of the Director General of Archaeological Survey, but on 13th February, 1873, the Central Government issued a directive assigning the local Governments the duty of caring for the preservation of all the monuments of historical and architectural interest. In 1878, there was a change in thinking. Thereafter it was felt that the preservation of national antiquities and works of art could not be left to the exclusive charge of the provincial Governments, which may not be alive to their importance.

(f) In 1878 again, the Treasure Trove Act was passed. This authorised the Government to take possession of any treasure unearthed, if its value exceeded ten rupees. The term 'Treasure' was also adequately defined. The year 1879 was of considerable importance in so far as the preservation of monumental edifices is concerned. During this year a proposal for the sanction of grants to the provincial Governments to carry out conservation works at the ancient monuments was mooted. This step provided ample testimony to the thinking of the Government which assumed responsibility for providing finance for the upkeep and repair of the vestiges of the past. For the imple-

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mentation of this proposal all proposals for repairs drawn by Provincial Governments were to be submitted through the Curator of Ancient Monuments, to the "Committee of Tastes" of the Central Government to be set up by it under the scheme, highlighting the features of archaeological taste involved in the proposal. With the passing of the above enactments the British Rulers in India took over virtually the control of the important vestiges of the past.

The interest of the common man, on the other hand, for the proper maintenance of ancient edifices, particularly the religious ones, never diminished. In the words of Lt. H.H. Cole (in 1881), "Natives of all creeds contribute large amounts for repairs to religious buildings, etc. and the trustees could see that the sums given for the purpose are properly laid out". Religious buildings with State endowments were considered as national property and as such it could not be allowed to fall into disrepair. He further classified the monumental buildings into three categories:

(a) Those in charge of Government;
(b) Those which were the property of the natives or in their use for worship;
(c) Those in native States.

The above classification of monuments is the earliest in the country, and forerunner of the concept of the monuments of national importance, which was finally projected in the Indian Constitution after independence of the country.

(g) Further, according to Cole, the financial implications involved in the maintenance of the buildings under the exclusive charge of the Government became the responsibility of the Government, while those at (b) and (c) were to be maintained by (i) public subscription, (ii) voluntary donations by private individuals or out of endowments or (iii) by the funds made available by the native rulers of their States.
(h) The above system did not work well and the exclusion of conservation from the scope of the Archaeological Survey brought forth comments from Cunningham, in 1885, who believed that "the trained and experienced archaeologists who examined, measured and described the buildings of different ages, were naturally the best authorities as to the style of all repairs which may be required to an

ancient monument. He pointed out that the only judicious arrangement could be to tie the conservation with exploration.

(i) In 1886 James Burgess supported the idea of close cooperation between the museums and the officers of the Archaeological Survey in the matter of conservation, description and study of the antiquities unearthed by the latter. But the unification remained a distant ideal and the machinery devised for the purpose hardly left any powers in the hands of the Archaeological Survey of India, since there was no authority with the Survey to improve or to modify the proposals received from the respective Provincial Governments.

(j) In 1900 the Government realised that the problem of such a magnitude could not be left to the exclusive care of the Provincial Governments. As a consequence, Sir John Marshall was appointed as the Director General of the Archaeological Survey of India to look after the preservation and conservation of the ancient cultural properties, besides exercising other normal functions. Even at this stage the policy of the Government with regard to the conservation of monuments remained unspecified.

(k) In 1904, the Ancient Monuments Preservation Act was passed to exercise control over the traffic of antiquities, protection of archaeological sites and other buildings of archaeological, historical and artistic value and their preservation. The responsibility for the maintenance of protected monuments was enjoined upon the Local Governments and under certain specified conditions voluntary contributions could also be accepted by Government for the repair of selected monuments.

(l) While spelling out the Government's policy on the conservation of ancient monuments in 1915, a distinction was drawn between older Buddhist, Hindu and Jain edifices on the one hand and the more modern erections of Islamic monuments on the other. In case of latter, the policy of limited restoration was sometimes not only prescribed but justified on the ground that the art of original builders was still a living one. It was also held that in the case of living monuments, more extension or restoration works were to be carried out than those buildings which were to be maintained as merely antiquarian relics. The central idea of the conservation policy was "*not to reproduce what has been defaced or destroyed, but to save what is left, from further injury or decay and to preserve it as a national* *heirloom for posterity.*

(m) In 1919, there was a second classification of monuments. Accordingly the ancient monuments both protected and unprotected were classified as follows for the purpose of conservation:

(1) Those monuments which from their present condition or historical artistic value, were to be maintained in permanent good repair.
(2) Those monuments which were required to be saved from further decay by such measures as the eradication of vegetation and exclusion of water from the walls and the like.
(3) Those monuments which were in an advanced state of decay or comparatively unimportant monuments and therefore it was impossible or unnecessary to preserve them.

The monuments mentioned at (1) and (2) above were further subdivided in the following categories:

(i) The monuments owned and maintained by the Government.
(ii) Monuments owned or maintained by private owners.
(iii) Monuments owned by private persons but maintained by the owners and the Government jointly or exclusively by the Government.

(iii) Archaeological conservation-definition of

Sir John Marshall brought out in 1922, the Conservation Manual laying the principles for conservation works, as under:

(1) Hypothetical restorations were unwarranted, unless they were essential to the stability of the buildings.
(2) Every original member of a building should be preserved intact and the demolition and reconstruction should be undertaken only if the structure could not be maintained otherwise.
(3) Restoration of carved stones, carved moulds on plaster mouldings, should be undertaken only if artisans were able to attain the excellence of the old.
(4) In no case should the mythological or other scenes be re-carved.

NOTES AND REFERENCES

1. Charak Sukhadeva Singh, *op cit.*, part III, pp. 92-93.
2. Cunningham's *ASR* 1902-03, p. 239.
3. Frankie A.H., *Antiquities of Indian Tibet*, p. 5.

3

Building Materials

Evidence of Texts

While tracing the genesis and evolution of ancient monuments in the country, it may be stated that architecture happens to be one of the hall-marks of civilization and must have begun with the rise of civilization itself. The finds at Harappa and Mohenjodaro cannot be regarded as non-Indian. The objects and remains unearthed from these sites portray a very advanced state of architectural activity, and have a high historical value. The Rigvedic allusions and references to a very advanced state of architecture also cannot be called imaginary. The literary evidence must have an equal importance in reconstructing the past history of architecture and the relevant activity as mirrored in the hymns of the *Rigveda* is a pointer. There are innumerable references in the *Rigveda* which point to the advanced architecture of those times.[1]

The post-Vedic literature, and later the epics, viz. the *Rāmāyaṇa,* and *Mahābhārata* provide ample testimony to the developed architectural genius of the contemporary age, which continued to the Puranic times. The other Sanskrit literature be it Brahmanical, Buddhist or Jainas, speaks of the highly advanced architectural activity in the country.

However, while tracing the building activity in the country, one has to refer to the remains of Harappa and Mohenjodaro. The buildings discovered in the excavation of these sites can be classified as under:

(i) Dwelling houses;
(ii) Public baths of religious or secular character;
(iii) Temples of some kind;
(iv) Raised platforms, or possibly tombs.

According to Acharya, "with regard to the existence of a temple, private or public, and emblems of worship Sir John Marshall appears to be in a fix. He can neither deny the implications of his own finds nor can he get rid of some kind of a prejudice. Thus in the following quotation he appears to deny the very thing he seems to believe 'All this, however, is sheer conjecture. Like the Minoans, the Indus people may have had no public shrines at all, or if they had them the shrines may have been wholly unlike their ordinary residences. Among the buildings of Mohenjodaro, are several those whose purpose we have not yet succeeded in discovering, and of these might have been a shrine as well as anything else.' Then he refers to two buildings which bear all the essential features of a Hindu temple. 'There is a little building containing two chambers, one much larger than the other with a corridor at the side, and there is the larger structure which comprises of a large central chamber with a corridor on its western and southern sides, a well and two other small chambers at its southern end, and a group of somewhat large chambers at its northern,' the original plan of which is obscured beneath latter accretions." Thus the building activity in the country can be traced to a remote past, which has come down to us in the present times.

The materials used in the construction of ancient edifices are discussed hereunder:

Wood

The building activity in the country can be traced back to the Harappan times followed by other such pre and proto-historic sites like Kalibangan, Rupar, Lothal, etc. The changes which Indian architecture had to witness during the first millennium B.C. have been brought out by Percy Brown[2] thus: "Towards the middle of the first millennium B.C. the social system of the Vedic community so expanded that towns arose at certain important centres, where the traditional structural features of the village were reproduced on large scale and in a more substantial manner. Owing to fierce rivalry that had sprung up between the various groups, the towns, which were the capitals of states were strongly fortified. They were of necessity surrounded by rampart and wooden palisades while within this enclosure the buildings were almost entirely of wood. The Vedic civilization now enters on an era of timber construction. In many countries there is an age when the inhabitants lived in forests so that they became closely identified with their woody environment, as their ancient folklore frequently testifies. According to the natural disposition and trend of these people the period during which they practised wooden construction was long or short but it was inevitably followed in course of time by the employment of more permanent materials for building purpose. With the early inhabitants of India the timber age appears to have been a long one, due no doubt to the vast extent of the *mahavana* or 'Great Wood' in which they were cradled, picturesque references to which find place in their epics. So closely connected with their existence were these forests that the early people developed a dexterity in wooden construction of a very high standard. Their pronounced manuplative skill in the material may be accounted for by their prolonged apprenticeship to the wood-workers' craft when they were forced to rely on trees around them for many necessities of life."

Cities largely of wooden construction, therefore began to appear in various parts of the country and according to Dhammapala, the great Buddhist commentator, they were planned by an architect of the name of Mahagovinda who is stated to have been responsible for the layout of several of the capitals of northern India (like Rajagriha, Sravasti, Kapilavastu and Kumrahar) in the fifth century B.C. This is the first mention of an architect in the annuals of the country.

Combination of Wood and Mud-bricks

It goes without saying that the earliest structures found in the country were made of burnt bricks as witnessed in the structures of the Indus Valley, using mud as mortar. Subsequent to this the excavated sites have provided evidence of the use of burnt bricks as well as mud bricks. It may not be possible to testify for the extensive use of wood in the Harappa and Mohenjodaro sites, though there is a strong possibility for the same.

Besides the bricks and the wood used in the construction of ancient buildings, stone was another material used for the same purpose, though its usage was made comparatively at a much later date. "In spite,[3] however, of the evidence of the literary records which indicate that much of the building construction (at early stage of Indian history) was of a temporary nature, the one example that has survived proved that some efforts were already being made to produce stone masonry of a durable character. The beginnings can be seen in the city wall of Rajagriha, the ancient capital of Magadha, now a vast area of ruins in the Nalanda district of Bihar. Immensely strong and of Cyclopean proportions, this wall consits of a rough pile of massive undressed stones, each between three and five feet in length, but carefully fitted and bonded together. The core between is comprised of the smaller blocks less carefully prepared with fragments of stone packed within the interstices, no mortar appears to have been used."

During the medieval times, the use of bricks in building structures became more popular as compared to stone. But sometimes both wood and bricks were used for the creation of structures. In South India, the walls of temples were generally of stone; the flat stone ceiling of *Garbhagṛha* was supported on teak wood joints; the superstructure was of brick. The structures combining bricks and wood are also found in the monasteries and wooden temples in Himachal Pradesh. Brick and wood, singly or combined were, it seems, frequently used but being easily perishable have vanished to a much greater extent than the contemporary buildings in stone.

Stone

Up to the middle of the third century B.C. the course pursued by the building art in the country is only indistinctly visible, as it is obscured by mists of time. So far, therefore, any account of its progress is based largely on the evidence of a miscellaneous order, such as certain structural remains and other investigations from which the foregoing conjectural impressions have been compiled. Megasthanese, the Greek ambassador in the court of the Mauryan emperor Chandragupta, described the grandeur of the assembly hall of this monarch. The remains of the said hall known as the *Chandraguptasabha*, had over eighty stone pillars, some of which have been discovered from the site of Kumrahar, close to Patna. These pillars still preserve the rich Mauryan polish. Stone has been used at Surkotada and Dholaveera in the Harappan context, too.

The use of stone in the construction of buildings became more wide spread with the coming into power of Asoka and subsequent to his conversion to Buddhism. More and more use of stone in building activities resulted. For instance,

(i) a series of edicts were inscribed on rocks,
(ii) a number of tumuli or stupas were erected,
(iii) certain monolithic columns were raised besides several monolithic accessories to shrines,
(iv) a group of rockcut chambers were chiselled out.

The great Mauryan empire disintegrated in 185 B.C. and was succeeded by Sungas who ruled up to 70 B.C. in the northern and western regions. The Sungas were supplanted by Andhras who had long been paramount in the west and south of India till they were overthrown in A.D. 150. The tradition of the use of stone for the erection of edifices, which gained popularity during the Mauryan times was continued subsequently during Sunga, Kushana and Satavahana Periods as is evident from the Buddhist stupas/shrines at Bharhut, Sanchi, Bodhgaya, Amaravati, etc. The period also witnessed the chiselling of rock-cut caves like those at Lomash Rishi cave (Barabar hills), Ajanta, Junnar, Kanheri, Bhaja, Ellora, Kondana, Karla, etc.

Burnt-Bricks

It cannot be claimed with certainty that with the patronage of stone for construction works, use of bricks was completely discarded for bricks enjoyed an important place in the matter of raising structure in the ancient past. Even the texts held bricks in high esteam, possibly because of their durablity and low cost involed in their making.

In the *Satapatha Brāhmana* VII, 4.2.32 the importance of brick has been defined thus:

अथाषाढ़ामुपदधाति! इयं वाषाढ़ा ।इमांवतदुयधाति ।

(He then lays down Invincible Brick. The Invincible being the earth, it is this earth that he thus lays down.)

In the *Agni Puraṇa,* XLI. 17, however, brick has been declared as the daughter of the sage Añgirasa thus:

अव्यङ्गं चाक्षतेपूर्णं मुनेरङ्गिरसः सुते ।
इष्टकं त्वं प्रयच्छेंष्टं प्रतिष्ठां कारयाम्यहम्

(O, daughter of the sage Añgirasa. Thou unbroken, unhurt and full in size O, Brick, grant those the desired object, I now install thee.)

Detailed directions are then given for making bricks. The *Mayamata* (XV. 114-200) for instance, instructs that the soil should be free from gravel, stones, roots, bones and clods for the purpose of making bricks. This soil should have fine sand, be of uniform colour, and pleasant to touch. For making bricks, one should throw a lump of earth into knee deep water and then stir and kneed it repeatedly forty times with one's feet. One should wet it with water of *Kṣhīra* (pine), *Kadamba, amra* (Mango) and *Abhayaksha* tree bark and water of the three fruits (*amalaka-emblic myrobalan, bahela* and *haritka*) and go on kneading it for a month. Then bricks of 4,5,6, and 8 *matras* in width and twice as long respectively or half, or one-third or equal to the given width in thickness, should be thoroughly dried up and then evenly baked. After an interval of one, two, three or four months, they should be thrown into water, by experts; thereafter they should be taken out of water and dried completely. This process would make the bricks, according to texts, fit for use.

These bricks were used as building material from the earliest times in India and gradually even temples were raised of bricks. Among the earliest preserved brick temples are: the temple at Bhitargaon in Uttar Pradesh, which belongs to the Gupta period; the Uttaresvara and Kalesvara temples at (Tagara) Ter in Osmanabad District of Maharashtra; their doors, beams and ceilings are in wood and they belong to about seventh century A.D. The Lakshman temple at Sirpur in Madhya Pradesh is also constructed of bricks and belongs to almost the same period.

Among the Buddhist temples, the outer circular brick wall and the inner circle of the wooden pillars of the temple at Bairat in Rajasthan date back to the third century B.C. Besides the nunery adjacent to the Stupa No. 2 at Sanchi, belonging to the Asokan times, and the monasteries and temples at Nalanda and other Buddhist sites were also raised in bricks. The temple at Paharpur rising with three terraces on a cross-shaped plan with recessed sides belongs to the eighth century A.D. A similar stupa structure was discovered from Lauriya Nandangarh in Bihar.

Combination of Burnt and Unburnt Bricks

The use of burnt and unburnt clay bricks goes back to the Harappan civilization. Mackay[4] has testified to the use of both these types of bricks at Mohenjodaro: "The foundation of the northern wall of room 24 descends as low as 18.3 ft. below datum and was constructed of alternate courses of burnt and unburnt bricks which all appear as heads on either face of the wall. He further testifies[5] that "A new type of masonry in which courses of mud mixed with pot sherds alternate with courses of burnt bricks was introduced in Late Ia phase. It is seen in rooms 11, 12 and 17 of House II, Block 17, and also high up the northern wall of the supposed Khan (Block-II) in Long Lane. Very similar masonry of alternate courses of burnt and unburnt brick lined the walls of Late Ia date of House VII, Block 7. Masonry of this later type occurs as early as the intermediate II Phase in the foundations of a wall in room 24 of

House II, Block-10. The only value of laying burnt bricks alternately with layers of other materials was, of course, economy." In some instances burnt bricks even carry inscriptions. In the Palampet temples of Warangal District (A.P.) even floating bricks were used in the construction of the *sikhara* and also to minimize the dead load of the *sikhara*.

Use of Rubble or Brick Ballast

The use of rubble or broken bricks for construction purposes is as old as the Harappan Culture, which was noticed by Mackay at Mohenjodaro: "The mud brick platform, through which it was somewhat difficult to cut, was made of sun-dried bricks of various sizes, one of which measures 11.9 x 5.8 x 5 inches. The base of this mud brick platform was 28 ft. below datum. Below it, a layer of rubble consisting of broken bricks, potsherds and rubblish extended down to 35 feet below datum; and it was in this layer that most of the finds were made for the most part broken pottery models of animals."

Combination of Brick and Stone

Besides the above, sometimes, bricks were also combined with stone for construction of structures of the remote past. In this connection, the testimony of Stella Kramrisch[6] would be more relevant: "In the building of the temple, the bricks--it will be shown that also the building stones are thought of in this connection as bricks—are as if pressed from the centre towards the perimeter by small hollow of the *garbhagriha,* the innermost sancturary of the temple; massively piled, they are its walls. These are now replete with the special substance of the bricks and they widen the perimeter ,of the temple with mouldings and fillets in the horizontal and by buttresses and various kinds of projections in the vertical directions. . . ."

Brick and also stone were used and are preserved in the sacred buildings and their accessory parts in the third and the second century B.C. respectively. Lithic not only in construction and but also in substance is the solid stone fence unearthed in Besnagar, M.P. It belonged to an *Uttama-Prasada* of Vasudeva—only its brick foundation exists—of which also the Garuda stone pillar with the inscription of Heliodorus, an inhabitant of Taxila, formed part.

The relation of stone and brick in the rites of laying the foundation of the temple is multiple. Where stones are used as 'brick' or their substitutes, the *mantras* by which they are invoked are the same. The stone brick may be relatively larger than the earthen ones.

Brick Construction

As already stated, bricks were usually prepared of well puddled clay with their edges so smoothened as to fit quite accurately. No specific system of bonding of bricks is forthcoming, but the method of header and stretcher was followed, care being taken that no two joints came over one another. Between the joints, a mixture of clay was interposed as an adherent, but only a very thin layer was provided, as bricks were brought into very close contact. Lime mortar appears to have been known as would be evidenced from the temple at Besnagar (Vidisha) of the second century B.C. and at Bodhgaya where it was sparingly used. The character of the brickwork excavated at Besnagar is quite remarkable for so early a date, as the faces of the bricks were grooved to hold the lime mortar, which when analyzed was found to be a type far advanced than that used by contemporary Greeks or Phoenicians.

Dry Stone Masonry

In ancient structures sometimes dry stone masonry was used because cement was then unknown to the builders. By this method, stones were kept in position without any cementing material. The earliest preserved dry-stone masonry is found in Stupa No. I at Sanchi, which was covered initially with a thick cover of lime plaster. The practice of building with cyclopean stones persisted in the Hindu temples; in the courses of dry stone masonry, carefully dressed and relatively very large stones were arranged in the Gupta temples of central India and the early Chalukyan and Chola temples in the South. In the Chalukyan temples, dry masonry with no cementing materials between the stones was employed in the early sandstone buildings. This is also true of the medieval temples of Deccan.

The Lime Mortar/Plaster

Various recipes for producing an adamantine plaster have been prescribed in texts like the *Brihat Samhita, Vishnudharmottara,* and *Silparatna,* which were used in different parts of India. The lime plaster particularly described in the *Silparatna,* the *Manasollasa* and the *Isansivagurudeva paddhati*, (IV, ch. XXXIII, 66-69) *Vajra baddha*, is an adamantine plaster used as ground for painting. The texts further prescribe cementing material for baked bricks and stones besides mud cement for unbaked bricks. *Mayamata* (XVIII, 92-115) also specifies details of ingredients for plaster, cement and the ground for wall paintings.

The Vajralepa or Plaster for Smooth Surface

The *Brihat-Saṁhita*[7] and the *Visnudharmottara* among the early texts give ingredients of various kinds of *vajralepas* (plasters) which were used in stone and brick. Besides their use as mortar for raising of structures, *vajralepa* also formed the ground for wall paintings, this is described in detail in the *Mānassollāsa*[8] or *Abhilasitārtha Chintamaṇi* a compendium compiled in the twelfth century. Four or five recipes respectively of the preparation and ingredients of *vajralepa* are given in the *Brihat Samhita* and in the *Viṣnudharmottara*. Two of the preparations are purely of vegetables, one consists of animal glue and vegetable substance, the fourth contains metallic substances and the fifth (*Viṣnudharmottara* Ic, 10-11) a concoction from cow hides, etc. in which lime is mixed. These different kinds of *vajralepas*, the 'adamantine glue' are used for external application on stone and brick buildings according to both the early texts. The said texts further indicate that these mixures are also used for cementing stone and burnt brick of buildings.

In the *Mānasollāsa*,[9] the walls to which lime plaster (*Śudha*) has been applied should then be coated with a paste of hide-glue mixed with white earth (Kaolin?) in three layers, and above it, another final coat of the same paste mixed with powdered conch etc. be applied. The passage clearly shows that the adamantine glue coating or plaster, the *vajralepa*, is applied in several thin coats above the lime plaster *Sudha*. The final coat of *vajralepa*, when completely dry, forms the ground for wall paintings. The text further describes the use of *vajralepa* which is made in different shades with the mixures of colours. In that case, the glue of boiled buffalo skin is collected on small sticks and allowed to harden. It is then put in an earthen pot full of water and melted. This pure glue is to be mixed with the respective pigments. It then becomes a tempered medium for painting on *vajralepa* ground. The wall paintings, according to the *Viṣnudharmottara* text, are executed on plaster, which in the main consists of bricks, variously powdered, mixed with clay and carefully prepared with gum resin, bees wax, liquorice, molasses, *mudga* beans, and other vegetable substances. Sand, etc. has also to be added in due proportion; the mixture is allowed to consolidate for a month or so, and is then applied to the wall and left dry. If this dry plaster is not perfectly smooth, it is coated with clay plaster mixed with resin and oil which is carefully smoothened and polished. The frescoes are then painted on this dry smooth surface on the walls.

The *Śilparatna*[10] describes different types of lime plaster mainly from powdered gravel, but also of powdered shell and with a portion of sand to which the following liquids are added:

(i) The sap of various milky trees, *Aśvatha, Butea Frondosa, Kadamba*, Myrobalan, or Mango juice or curd, milk, coconut water, ghee, as well as ripe bananas, pulse, rice gruel, etc. according to different types or desired qualities of the plaster.
(ii) The last of the above varieties of plaster, *vajralepa* is described, which contains: 100 parts of lime, 2 parts resin (*karala*) and small quantities of ghee, bananas, coconut water, pulses, *Asvatha* sap and jaggery.

The use of stucco in construction work has also been testified by the epigraphical records, as is evidenced from the following instances:

(1) The Ratnapur stone Inscription of Jajalladeva, dating back to A.D. 1114, records the establishment of a monastry for ascetics, the making of a garden and of a lake, probably also the foundation of a temple at Jajallapura and the grant of a village Sirauli, etc.: for the maintenance of shrine—verse 16 of the epigraph says that it was built over with extensive stuccoed building and was without a second. (*Epigraphia India*, I, pp. 36-38)
(2) A tenth century *Prasasti* of the Chhinda records the construction of two temples, dedicated to Siva and Parvati. In verse 28 of this epigraph it is recorded that these were the temples, which filled everyone's heart with wonder. The splendour of these edifices equalled to the two high tops of Kailasa, which were made with white stucco. (*Ibid.*, pp. 75-86)
(3) The Teki plates of Rajendra Chola refers to stuccoed or whitewashed large house thus:
Kailāśa-Śaila-Vilasinas Samuttumgga-Sikharasya Saudhasyasthanabhumau.
(*E. Ind.*, Vol. VI, p. 342)

The Painting Material

As regards the material required for the drawing of fresco paintings, it may be pointed out that Yasodhara on *Kama Sutra* of Vatsayayana specifies the requirement of an artist for the purpose, thus:

रूपभेदा प्रमाणानि लावण्यं भावयांजनम् ।
सादृश्यं वीर्णकाभङ्ग इति चित्र पडङ्गकम् ।

> "Varieties of beauties, proportions, representation of sentimental grace, resemblance, colour and relief are the six fold elements of paintings."

The Samaraṅgaṇa Sutradhara, however, speaks of the following items which are essential for pictorial art:

(i)	Vartika	Paint-brush
(ii)	Bhumbandhana	Canvas (or Smooth surface)
(iii)	Lekhya	Drawing
(iv)	Rekha Karma	Delineation and articulation of form
(v)	Varnakarma	Colour
(iv)	Vartana	Display of light and shade.

Use of Dowels/Bolts, Clamps and Nails

In huge stone structures, some times it becomes necessary to provide dowels or clamps in order to prevent their sliding. These dowels in the early stages of Indian architecture were made of copper, which could be evidenced from the Asokan pillar at Lauriya Nandangarh. In this connection Percy Brown[11] has observed as follows:

> "The aesthetic properties of the pillars are concentrated in the design and execution of the capitals and the superstructure. These portions of monuments which together average seven feet in height are in one piece of stone, while the shaft of the column consists of another separate piece, the two being joined by a copper bolt accurately fitted into the tenons made for it without the use of cement. The bolt in one of the Rampurva pillars has been preserved, and is a barrel shaped piece of metal over two feet in length. Showing that those who employed this copper dowel were quite aware of the distructive action of iron and other metals in such circumstances."

In the later period lead was also used for the same purpose, but in the medieval times, the use of iron as clamps, bolt or nails became quite common in structures.

Polish on Stone

The Indian artist not only excelled in the art of making edifices in stone and other material, but also attained the highest perfection in creating a glazed finish thereon. The earliest example of providing lustrous finish on stone, is available from the Mauryan columns. This lustrous finish, according to Percy Brown,[12] was obtained, by the laborious application of an agate burnisher, and somewhat the process was adopted in the pillars and other sandstone objects. In completing their handy work with this glazed effect the Asokan artificers were following the procedure of all early stone workers, as the aim for instance of the 12th dynasty Egyptian masons was a 'glass surface' while the identical stone work of the Greeks is described in the Homeric poems as 'polished shining glistening'. It is doubtful, however, whether the creations of any of these great building nations could compare in this particular respect with the brilliant enamel-like polish obtained by the Mauryan craftsmen. So striking in its appearance that in the fifth century, it excited the admiration of the observant Chinese pilgrim Fa-hien, accustomed as he must have been to the famous polished lapidary of his own countrymen, for he writes that it was 'shining bright as glass'. And even in spite of over two thousand years of the most destructive climatic conditions these monuments retain much of their highly glazed surface at the present day.

But V.S. Agrawala had discounted the theory of achieving glazed effect on the Asokan columns, by using agate burnishers. Instead, quoting from *Āpastambha Śrauta Sutra,* he considers that the glistening effect on Mauryan columns could have been achieved by the application of a recipe, which could be manufactured out of the ingrediants spelt out in this text. The latter theory seems to be more appealing, because the application of such recipes is noticed in the early Indian pottery as well.

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1. Rgveda, IV, 148. 200, II. 313, II. 41.5, IV. 179, V. 62.6.
2. Brown, Percy, *Indian Architecture,* Bombay, 1956, pp. 4-5.
3. *Ibid.*, p. 5.
4. Mackay, E.J.H., *Mohenjodaro and Indus Civilization* (Delhi, 1938), p. 11.
5. *Ibid.*, p. 164, pl. XX.
6. Kramrisch Stella, *Hindu Temples,* II, p. 103.
7. *Brihat Samhita*, Ch. LVI, 1-3, 5-8.
8. *Manasollasa*, pt.-III, Ch. CXII, 1-15.
9. *Ibid.*, pt.-II, III.I, 132-40.
10. *Silparatna,* XIV, 58-75.
11. Brown, Percy, *Indian Architecture,* (Bombay, 1956), p. 11.
12. *Ibid.*, p. 12.

4

Structural Repairs, Reconstruction and Transplantation

While dealing with the subject of the maintenance and unkeep of the ancient monumental edifices in the country, it may be recalled that such an exercise requires wise management of resources, sound judgement and a clear sense of proportion besides desire and dedication to ensure that our cultural property is well preserved for posterity. Indeed the vestiges of the past are the sacred trusts handed down to us by our ancestors; these have in turn to be handed down to the generations of the future in safe and sound condition. A true conservator would therefore, carryout conservation/preservation works, at an edifice not only keeping intact its historical background, but would also make the best use of the material already available at the site and do nothing that could amount to sacrilige of the edifice.

Indeed the long term conservation policy with regard any monument has to concentrate on the arrest of the agents of deterioration. Conservation/preservation of cultural property is therefore a process which ensures prolongation of the life of the historical structures to be inherited by posterity in a well preserved manner. The cultural properties available in the country have their individual historical values based on:

(i) The age to which they belong,
(ii) the material used in their construction,
(iii) sound or unsound condition of the structure,
(iv) the historical event or events connected with each one of them, and
(v) their exact location.

Of course every individual monument in the country is connected with some historical event in one way or the other, which it mutely witnessed at different stages of its existence; this has to be kept in view while carrying out repair or renovation work to it. As for example a royal bed room, after repairs should not give the appearance of a durbar hall, nor should an audience hall made to look like a harem in a palace structure. Though it may be necessary to reshape a structure for the purpose of its reuse, viz. for housing a museum, an antiquity godown or a library, but the basic elements of the structure should be maintained.

Before embarking on the subject of actual conservation or preservation of a historical structure, it would be worthwhile to discuss the reasons or forces responsible for its damage and decay.

Causes for Decay/Damage

Natural Causes

(i) Climate is one of the basic and main causes of decay or damage to a building. In India there are climatic conditions having extreme heat and cold, besides desert conditions in Rajasthan. In the extreme north there are snow clad mountains, which in winter have sub-zero temperatures, while in summer in plains, the temperature soars to 45-50 degrees Celsius. The resistance of building materials to extreme climatic agents decreases with their exposure and age. Even in temperate Zone, solar radiation is found to be more destructive than frost.

(ii) Water in all its forms is also an important agent that promotes chemical reactions and gradual deterioration of buildings. In India, we have plenty of rains throughout the country, (leaving desert areas of Rajasthan), which cause extensive damage to the structures, new or old. Moisture is another factor which badly affects ancient structures. The presence of water in various forms accelerates the decay of most of the structures. The excess of water in porus masonry materials may be caused by rain. Water, through excessive rains reaches masonry surface when the rains hit the surface. It may reach the surface indirectly as well.

(iii) Environmental pollution also contributes massively to the decay of monuments. This is of two types, viz. natural as well man-made. In the natural environmental decay, sea breeze plays considerable havoc to structures, particularly those made of stone. The shore temple at Mahabalipuam and the Sun temple at Konark, could be quoted as examples. These structures are being threatened due to sea breeze, and could be saved because of extensive preservation works undertaken there for the past many decades.

(iv) Sub-soil water or saltpetre action is also responsible for gradual decay of monuments in some parts of the country. The structures close to the sea shore, river banks, reservoirs or tanks are particularly damaged by sub-soil water.

(v) Tornados or hailstorms due to different atmospheric pressures in the weather system, are responsible for extensive damage to the monuments. The coastal areas are particularly prone to such cyclonic gales which have devastating effects.

(vi) Natural calamities like earthquakes cause extensive damage to ancient structures. It is on record that the temple of Vajresvari at Kangra was completely ruined in the earthquake of 1905, and a new structure was erected there subsequently.

(vii) Floods in the river, streams, etc. also account for the damage to structures, together with lightning. It is on record that the wooden post in the compound of the Bijli Mahadeva temple in Kulu, is demaged by the lightning quite often.

(viii) Wild growth: Ivy, creepers and other forms of plant life cause considerable damage if allowed to grow freely. In the Indian climatic conditions wild growth at the monuments is commonly found and persistent and sustained efforts are needed to have them eliminated in order to save the structures, because their unchecked growth could damage the very foundations of the structures.

(ix) Birds are also sometimes the cause of damage to monuments, wherein they make nests at some soft spots, sometimes by digging holes. Bats are indeed a nuisance at the monuments. Though they do not cause severe damage to the structures, but their very presence at a monument has a sickening effect. Beehives are also commonly found at certain monuments in India. Though they do not cause much damage to structures, but cause nuisance to the workers and the visitors.

(x) Bacteria and lichen can also cause decay of building materially by producing acids which react chemically with the structural material. The growth of bacteria and lichen was widespread at the temples at Khajuraho, which was removed by extensive and prolonged chemical action.

(xi) Insects and other pests are also responsible for destruction of wood work in a structure. These insects cause great amount of damage by weakening structural timbers.

(xii) When the sub-soil water in summer or in draught goes considerably down, cracks are bound to appear on the surface of the structure.

Man Made causes

(i) Of all man-made causes for the destruction of monumental edifices in the country, vandalism is the foremost. This tendency of the unscruplous elements have deprived the country of much of her cultural heritage. These elements damage images or parts of monuments in such a way that it becomes irreparable. By these acts of vandalism, not only are the fixed sculptures at the monument removed, but in cases where it may not be possible to do so, their heads are chopped off and exported out of the country for obvious reasons.

(ii) Damage to monuments is caused by vibrations. The monuments which are located by road side, airports, rail tracks, etc. are affected the most. Quarrying of stones in the vicinity of the monument, or other blasting operations cause damage to the ancient structures, the foundations of which are not strong enough to withstand such vibrations.

(iii) Atmospheric pollution can cause damage to the monuments. The Taj at agra happens to be the foremost example of such a case in the country. Because of the Mathura Oil Refinery and the loco-shed near the Taj, the marble slabs on the facades of the structure were showing traces of blackening on the surface. While the loco-shed was removed from the proximity of the Taj complex, steps have been taken by the Mathura Oil Refinery to protect the structure from the ill-effects of air pollution.

Inspection notes

After having a glance at the natural and man made causes, which adversely affect the monuments in the country, the next step would be to critically examine a monument for the purpose of conservation, keeping in view these causes responsible for its deterioiation, as these have to be eliminated during the course of the execution of repair or conservation of the edifice.

The methodology of the entire conservation depends upon making an inspection and drawing reports at regular intervals on all items of the concerned cultural property and its values. The extent and nature of the historical buildings have to be defined and their relationship to their surroundings must be included, since the architecture cannot be separated from its site. It is the immovable structure which has to be seen as a whole. Therefore, before the start of repair works at any particular monument, it is desirable to have a detailed inspection report drawn by competent experts in the field, highlighting the following aspects:

(i) Geographical situation along with historical background of the edifice should be brought together with the period to which it belonged, its utility and a brief account of the sequence of events concerning the same.

(ii) Detailed description of the surroundings with special reference to recent development activities.

(iii) Architectural details of the different parts of the structure and the material used in the original construction, and the particulars of the used material lying at site, which could be reused have to brought out.

(iv) The salient features of the architectural designs, peculiarities of decorations or ornamentations applied both in the interior and exterior, be defined.

(v) Conditions of the sculptures, paintings, stuccos, and epigraphs, etc. forming part of the structure be spelt out.

(vi) Whether the original foundation or superstructure of the monument is intact or not. Any structural defects or deformities should be described fully, with details of the steps to be taken for their rectification.

(vii) In case the structure is adversely affected by constant or occasional vibrations like blasting of rocks, rail or road tracks, close to the monument, the same should be specifically mentioned together with the measures needed to avert the same. Special measures are also required to save the monument from the fast growing wild growth, gaining deep roots, some times affecting the very foundation of the structure. A distinct note of the same has also to be taken in the inspection note.

(viii) All cracks appearing on the structure should be clearly described and if need be, tell-tale glasses be fixed to the structure to watch their further development.

(ix) Since the structures are required to be maintained in the original style, it would be necessary to suggest the extent to which the existing material could be used for repair or renovation purposes.

(x) Status of drainage-system be examined and defects therein be specified.

(xi) Whether lightning conductor is necessary, particularly for the high-rising *Gopurams* temple *Sikharas*.

(xii) Details of conservation works carried out earlier.

(xiii) The report should be accompanied by a site plan of the monuments, photographs showing the damaged portions and scale drawings indicating the quantam of work to be carried out. The photographs of any modern development work close by and earlier conservation works should be included.

(xiv) The report should indicate precisely:

- (a) the items of work of unavoidable nature to be carried out immediately without delay;
- (b) the items of works requiring attention to prevent further deterioration of the existing structure from rain water, insects or fungus;
- (c) the items of work which could be taken up on low priority basis;
- (d) items of works to be taken up keeping in view the future development programme of the monument.
- (e) such items of work which could be taken up after keeping the structure under observation for some time.
- (f) the structural analysis should be brought out giving the specifications of items of work conditions of roofs, floors, staircases, domes, arches, masonry walls, internal fittings, drainage system, bulged portions and cracks.
- (g) specific mention may be made about the use, if any of heavy machinery like bull-dozers etc. while executing the work.
- (h) any surrounding land has to be acquired in the interest of safety or beautification of the monument.

Precautions needed during Conservation

Once the inspection report for the structural conservation of a monumental edifice is drawn, estimates for the works are prepared and approved by the competent authority the repairs have to be started as soon as possible. During the execution of such works some precautions are necessary, which are detailed below:

(i) No religious edifice should be demolished, dismantled or injured in the execution of the conservation works without the full and free consent of the persons interested in it, or of a representative body of such persons, nor without the concurrence of the proper concerned authority of the area stationed on the spot, in writing except under the orders of the Central or State Government within whose jurisdiction the edifice stands.

(ii) Whenever scaffolding is required to be erected at a monument, it has to be ensured that it does not in any way cause injury or scratches on walls or floors. It might be necessary to provide sufficient padding of gunny bags or other stuff available on the floors and on the walls or other parts of the structure.

(iii) While attending to the restoration of a part of a structure, the original pattern, design and architecture has to be adhered to while making maximum use of the original material. Even the new material used in the work should not be made conspicuous, but should be made to match with the original one.

(iv) All overhanging parts of masonry should properly be strutted up and loose bulged masonry likely to collapse be immediately supported by wooden planks and ballies pending restoration.

(v) As far as possible original bricks of the structure should be reused in restoration work. In case old bricks are not available, new bricks of the same dimensions, size, colour and fabric have to be procured by getting them manufactured to specification given by the concerned authority with special reference to composition, size, colour and strength.

(vi) The brick masonry has to be executed with original bond and the mortar joints have to be recessed to about 6 mm to 12mm from the face and the brick work has to be kept clean from the mortar.

(vii) All restored stone members should match with the original masonry or rock in texture and colour, and have to be dressed suitably for the purpose.

(viii) The decayed or damaged vaulted roofs and arches have to be centred and shuttered up adequately.

(ix) Narrow cracks could be filled with lime or cement grouting, penetrating deep into the cracks. However, the wider cracks have to be stitched suitably before filling them with lime or cement concrete and grouting with liquid mortar.

(x) A dose of water proofing compound could be provided while filling cracks in the roofs.

(xi) While restoring the inlay work, the edges of the existing surface need not be scrapped but effort should be made to carve out the stone to the exact size for the purpose.

(xii) Damaged or loose plaster available on the surface of the walls could be preserved by injecting lime grout or plaster of Paris into the hollow cavities before finally filleting the broken edges of the lime mortar.

(xiii) The damaged masonry of the intermediate sections has to be carefully underpinned working from back to front. The height of masonry to be underpinned need not exceed a metre. Subsequent masonry could be further loaded only after the earlier one is properly set.

(xiv) Repair and restoration of out of plumb and alignment portions of the ancient structures pose considerable problems, and have to be taken care of quite carefully, besides the wood work, etc. In this connection it would be of interest to bring out here the methodology used in the actual conservation works. A note on the repair carried out at the Lady Rosary Church, Old Goa, appearing in the *Indian Archaeology*, 1983-84, (pp. 226-27) records as follows:

"The spongy plaster patches of the inner and outer faces of walls were completely removed and the outer faces of the walls were given a snowcem wash of ivory shade as a preservative coat and the inner face of the walls was given shell-lime wash. The decayed members of the doors and windows including damaged and missing oxidised fixtures were replaced with new ones and painted with oil paints. The roof was made water-tight with the renewal of broken and missing Manglore tiles. The floor of the main hall and the porch was paved with well dressed blocks of laterite stones and the joints were painted with cement mortar as per original. The cracks on the walls and on arches were grouted with cement mortar and the missing mouldings were reproduced as per original. The collapsed portion of the sacristy in the northeast corner along with the flight of steps of the first gallery was restored as per original. The decayed wooden rafters, beams and planks of the flooring of the gallery were replaced with new ones . . . ." The restoration of the bulged portion in the St. Assisi Church, Old Goa, has been reported as follows:

"The bulged and spongy plaster patches of the outer and inner faces of the walls were scrapped off completely and replaced with fresh lime-cement mortar. The outer faces of the walls were given a snowcem wash of mild-cream shade as a mortar.

(xv) Sometimes it may become necessary to replace the old and worn-out stones. A note on the subject appearing in the *Indian Archaeology,* 1983-84 (pp. 229) speaks as follows:

"The monument popularly known as the shaking minars, (Ahmedabad, Gujarat) had suffered damages due to constant shaking and movement of a large number of visitors inside. As a result, the basal stones of the southern minar had wornout. These were carefully chiselled and replaced by new stones as per the original. The missing *Chajja* and *Kakashasana* in both the minars were replaced. Likewise, the brackets and supports in both the minars were restored with new ones of original decoration. The cornice stones in each storey of both the minars were thoroughly painted and copper dowels were provided in each stone duly fixed with lead. Mortar was raked out before repainting . . . ."

(xvi) Besides the ancient structures, the rock hewn caves have their own importance in Indian art and architecture. The structural conservation of these caves is quite problematic at times. For example, the Bagh Caves in Madhya Pradesh have been a source of recurring headache for conservators for a considerably long time. The main problem there was the continuous percolation or seepage of water from the walls of the caves, which had damaging effect not only on the fresco painting of the caves, but also over the hewn structures themselves. In this connection, the methodology used by the experts in the field (as reported in the *Indian Archaeology*, 1981-82, 1982-83 and 1983-84) is detailed hereunder:

"In order to drain out the water accumulated on account of percolation, a net work of drains were cut in caves 4-7, in the rock floor and were connected with the main drain. The construction of R.C.C. pillars in place of the damaged ones in Cave No.2 has been taken up.

After taking precautionary measures like the erection of temporary brick pillars and piling of sand-bags to prevent the collapse of roof, the first phase of drilling and grouting operations before rock-bolting has been taken up on the roof. The machines required for the purpose were transported to the roof, G.I. pipe-lines and centrifugal pumps were also installed on the roof for the supply of water from the river. Steps were also taken to prepare the exact plan of the caves to determine the affected zone for drilling and grouting. According to the consensus of various expert institutions, the drilling operation was planned initially along an alignment at about five metres beyond outer extremeties of the caves on the roof marking the bore holes at five metre intervals. The depth of the drilling performed was about 22 metres from the top. This operation beyond the cave was undertaken mainly to provide a grouted barrier to check the seepage of water from outer source. So far twenty-six bore-holes have been drilled and ten completely sealed after grouting with cement slurry and reinforcing with M.S. rods. The total area of drilling successfully executed is about 585.55 square metres. The grouting operation is being done at a pressure of 2.5 kg per square cm. The material of the rock from different levels of each bore, has been collected for permeability and percolation test." (p. 115)

In the *Indian Archaeology* for the subsequent Year (1982-83, pp. 184-85) it was reported that:

"In Cave No.2, five damaged pillars were dismantled. In their place four R.C.C. pillars were constructed, decorated with architectural designs and geometric patterns matching with the original in colour, tone and texture.

"The consolidation of the roofs of the caves on account of seepage of water was carried out by massive drilling and grouting. The entire surface of the cave was surveyed and the ground floor plans of Cave Nos. 4,5,6, and 7 were exactly transferred on the top of the rock over the caves and portions of *Chaityas*, cells, pillars and stupas were precisely marked thereon. The bore-hole points were selected to diffuse the strongholds of seepage of water both for curtain grouting and blanket grouting. The spacing between each bore-hole was determined keeping in view the affected area to be covered by the individual bore-hole. The bore-hole points located in curtain grouting were about 5 metres away from the outer extremities of the caves and drilled to about 22 metres in depth with 2 metres or so below the existing floor level of the caves. After providing this curtain around the eastern and southern sides of the caves at the cliff, the bore-holes, about 5 metres centre to centre, were marked over the roof surface of the caves. These bore-hole points selected for roof consolidation were drilled to a depth of 10 to 12 metres leaving a margin of 3 metres from the ceiling of the caves to allow the cement slurry to spread of fill up all the fissures and cavities. Each of the holes bored was grouted by injecting liquid cement slurry with the help of specially designed grouting apparatus at a pressure of 2.50 kg/cm^2 and the hole was finally sealed by cement concrete."

The above conservation work was undertaken by the Archaeological Survey of India, in collaboration with the Geological Survey of India, Nagpur, Mineral Exploration Corporation, Nagpur and Central Mining Centre, Dhanbad. After the said operation it is reported in the *Indian Archaeology* 1983-84 (p. 204) that it had been possible to arrest the seepage of water at Bagh Caves to a considerable extent.

Another grouting work is reported to have been carried out at Jama Masjid, near Hussainabad, Lucknow, in the 1983-84 issue in *Indian Archaeology* (p. 218). According to this report the "cracks and the terrace roof of the Jama Masjid were grouted and stiched. The decayed lime concrete of the terraced roof was redone with fresh lime concrete. The worn out floor of the northeastern hall was repaired. The decayed lime plaster on the walls and pillars were removed and replastered reproducing some profusely moulded geometrical and floral designs matching the originals. The western and southern facades of the mosque were also repaired and the worn out *lakhauri* and brick work of the walls was underpinned and replastered and moulded designs carved in stucco were restored in certain places."

(xvii) In the suspended ceiling and plastering wooden or metal laths are usually used. In India, with its tropical climate, metal laths are more useful than their wooden counterparts which are subject to excessive swelling and shrinkage in different weather conditions. These wooden laths more often than not develop cracks and are damaged by white ants. In cases in which the use of wooden laths becomes obligatory or unavoidable only seasoned wood of high quality is to be used.

(xviii) Ornamental or stucco plaster is used for internal as well as external decoration or the plastering of walls. Stucco-plaster has to be used for repair of similar type of work in a structure.

(xix) Whenever the method of grouting has to be applied for either conservation of a structure from cracks or saving other parts from the threat of disintegration, the grout used has to be in the proportion of 1:1 to 1:4. This formula can be applied both in the cases of hand as well as gravity grouting.

(xx) In cases where there are patches of original plaster on the surface of the wall or ceiling, they could be preserved by filleting the broken edges with lime or cement plaster in order to prevent them from further decay.

Conservation of Excavated Sites/Structures and Trenches

Ever since the start of the British rule in India, several archaeological sites have been excavated, including those of Harappa and Mohenjodaro (now in Pakistan) which have carried the cultural history of India back to about 3,500 years. After excavation the preservation of these sites becomes a major problem, because the structures which remained covered for centuries by debris suddenly get exposed to sun, rain and other natural or man-made causes. Broadly speaking these sites can be divided into the following categories:

(i) Sites having stone structures,
(ii) Sites having structures of burnt clay bricks,
(iii) Sites having structures of mud-bricks or clay,
(iv) Excavated sites near sea shore.

In so far as the sites with stone structures are concerned, these may not pose much of a problem in their preservation. But even in such structures adequate arrangements have to be made after excavation for providing proper outlets for rain water and making the structure water-tight in order to protect it from seepage of water through the joints or cracks, which need be properly treated. Special attention has to be paid to prevent rain water from stagnating within or around the excavated structure, as this could prove harmful to the structure.

Sites having burnt brick structures from earliest times are available in the country. The structures at Sanchi, Nalanda, Paharpur, Bhumra come under this category. The conservation of such sites may not pose any particular problem, but bricks themselves are quite open to gradual decay or deterioration. Such structures have to be saved from rain or dampness. To achieve this objective these structures have to be kept free from moisture and fungus growth besides dampness. Outlets for rain water through adequate drainage is essential. In addition, periodical coating of the preservatives would add to the stability of these structures. Whenever decayed bricks have to be replaced, the standard modern bricks should not be used for the purpose; instead bricks made specially of the same size, strength and composition as the original ones are to be used.

Aging and decay of pointing are the most common defects in brick work. Besides individual bricks also decay due to frost action and often develop vertical and diagonal cracks, particularly through the arches of windows and walls above lintels and below sills. Rain water enteres into the structure through these cracks and weakens the walls resulting into final disintegration of parts.

Vertical cracks can be repaired by putting in new matching brick work or, if the coursing is out of alignment, it can be restored with pieces of matching roof tiles. It is essential that the bricks used in the repairs or restoration should match with the old ones in colour and size and strength and while restoring, the old form of bonding and jointing should be followed. Equally important is the colour of the mortar and the profile and texture of pointing. For repointing, brick work should be raked out to a minimum depth of about 20 mm and pointing should be inserted with a special trowel.

The cavities in walls caused by the deterioration of bricks need not be covered by cement. In case the face of a wall is required to be renewed, it is best to tie the new brick work back to the old as in the cavity wall construction and the gap between the old and the new bricks may be grouted in order to prevent the seepage of water and frost action.

The preservation of structures of mud bricks or those plastered with clay pose a complex problem, because such structures are likely to decay rapidly and cannot face excessive rains. Attempts in such cases have been made to preserve them by erection of tin sheds, but they hardly serve the purpose, because these sheds cannot withstand strong winds or storms and they mar the very aesthetic sense of the environment. Moreover such sheds can be of some use at small sites, but cannot be useful at large sites. The approach for the protection of mud walls should be such as to save them from excessive rains, which could be done by placing some straw mixed with mud over the tops of the walls as is done in any village in India. But this method could only serve for a season or so, and cannot secure the structure permanently. Alternatively, the tops of the walls could be covered with alkathin sheets under expert advice.

The methodology to be adopted for the making of mud bricks for replacement of the damaged bricks and other repairs to mud brick walls could be as follows:

(1) The local clayeysoil as originally used for the manufacture of mud bricks should be taken and mixed with sufficient water and kept immersed in water for a week. The wet soil is then mixed to form a slurry consisting of 8 parts of water to 1 part of sand and one part of Portland cement. Chopped straw is added to improve the mechanical properties of the mix which is then set to dry in moulds resting on sand, which gives a rough texture. The bricks should have a wet net covering for about a week and be turned over after three days to ensure even drying. After a week they are to be dried up in the sun.

(2) The top of the mud brick walls, if not roofed over, needs special attention. A sloping rendering of mud-cement mortar made like mud bricks but without the addition of straw, cannot be of much use, because it develps cracks after setting, even if done with two coats. Mud cement mortar is however useful for grouting cracks in walls, because it is not subjected to rapid drying.

(3) Treatment of mud brick walls can also be carried out by the use of ethyl silicate 40.

(4) Mud brick walls can be repaired by the removal of the defective bumps and insertion of new bricks of almost the same size and strength which are then plastered over and lime washed to match the old surface.

Indeed archaeological excavations pose considerable problems of maintenance primarily due to lowering of the ground level. Steps have therefore to be taken effectively to deal with rain and rain water which might destroy all the evidence being labouriously acquired. Adequate arrangements are therefore to be made for proper drainage of the rain water etc.

Another method adopted by the archaeologist to preserve the excavated sites is to fill up the trenches with earth after the excavated material is taken out and the report on the excavation is prepared. This method has some inherent deficiences in as much as that the trenches or the excavated sites permanently get out of the reach of the future scholars. Because of the total separation of conservation from excavation, even where an attempt is made to preserve the excavated sites, little care is taken by the conservation staff to provide proper treatment to the newly exposed structure. In the fitness of things, better results could be achieved if the work of initial conservation of the archaeological site is left to the excavators, who perhaps could do more justice to the task of its preservation.

The excavated sites at sea-shore pose the biggest challenge in the field of preservation because of the sea breeze as well as the underground water level. The prime example of this type is the Lothal site, which is in disarray after the excavations. (I have been informed by one of the officers of the Archaeological Survey of India, that the excavated dockyards and other remains unearthed at Lothal are gradually disappearing because of adverse climatic conditions as well as the problems of ground water, etc.).

Reconstruction or Transplantation

(i) *Reconstruction*

Reconstruction of ancient monumental edifices by using new materials could be necessitated by disasters, or other natural calamities. For example, the massive wall of the Purana Qila monument at Delhi, gave way during rains, some times back and had to be reconstructed to save the monument from further decay. The reconstruction of a monument should be based on the initial documentation of the materials it is built with. But in cases where no prior documentation is possible because of the sudden collapse of a structure, efforts for its reconstraction should be based on the original patern of the edifice.

(ii) *Transplantation*

This amounts to moving of the entire structure piece by piece to new sites. Though it entails the loss of essential cultural values and generation of new environmental risks, but still this type of work might be taken up because of over-riding national interest. One of the best known example of the transplant of this type was taken up in Egypt when the temple complex of Abu Simbel (XIX Dynasty) was moved to a safer site to prevent its submergence the reservoir then coming up of the Aswan High Dam on the River Nile.

In India, however, which is a developing country, with several of the development projects in progress, including the building of dams and reservoirs, some monuments are likely to be threatened with extinction. One of the earliest such work of transplantation was taken up at Nagarjunakonda, where the ancient site was to be submerged in the reservoir of the Nagarjunasagar Dam in Andhra Pradesh. The ancient monuments scattered in the valley of the Krishna river were shifted to the top of the Nagarjuna Hill site and transplated there. (This was a gigantic task which was accomplished successfully by a team of experts of the Archaeological Survey of India, under the guidance of late Dr. R. Subhramanyam.

Another transplantation of momuments was taken up also in Andhra Pradesh, where the Papanasi group of temples at Alampur in Mehbubnagar district were dismantled from their original locations and transplanted to the newly acquired site consequent to the coming up of the Srisailam Hydro-Electric Project. Similar transplantation of the Sri Sangmesvara temple, Kudavalli, was also taken up in Andhra Pradesh.

Both these works were carried out by the Archaeological Survey of India while the transplantation of Bhattiprolu temples was under-taken by the Deptt. of Archaeology and Museums, Government of Andhra Pradesh.

The transplantation of ancient structure devolves a great responsibility on the conservators as well as the workers in the field, particularly in view of the fact that:

(i) these structures are centuries old, and are often damaged. Among the structurally unsound portions some could be visible to the naked eye, while others could be invisible and so are more dangerous while handling,

(ii) the architecture of such structures was developed in the ancient past and the same expertise might not be available locally and the required needed skilled artisans might have to be brought from far off places,

(iii) even the brick or stone masonry, which outwardly may seem to be sound, may not be so; while actual handling, some of it might cave in and cause heavy damage,

(iv) since these are ancient structures, they cannot be dismantled with heavy machinery, the dismantling has to be done so by manual labour very carefully, preserving every bit of the archaeological evidence available for use during reconstruction work.

However, in the case of actual transplantation of monuments, the task has to be accomplished at different stages, which are described hereunder:

(i) Documentation

The first measure to be adopted in the process is the complete documentation of the edifice. A detailed structural drawing should be prepared. In case the structure is made of stone, each and every stone on the outer and inner surface has to be numbered carefully and shown in its exact place on the drawing. By indicating the stone thus in the drawing one could easily locate the same while re-erecting the same structure. Besides, the photo documentation of each and every part of the structure should be done extensively, which shall serve as a practical guide to the experts in the field, who are responsible for the transplation of the edifice. As soon as the complete documentation, i.e. drawing and photographs is over and each and every stone is suitably numbered, the dismantling of the structure has to be taken up.

(ii) Dismantling of Structures

This is the second stage of the work. The dismantling of the structure should start from the top and each dismantled piece or object should be properly stored, after providing the actual documentation number on it. For heavy pieces chain pulley could be used. As far as practicable the pieces of outer structure and the inner structure may be stored separately in order to avoid subsequent confusion.

It may not be difficult to properly document the stones up to the foundation level. But while digging for the foundation stones, extra care has to be taken for the photographic as well as architectural documentation. In case there be paintings on the walls of the structures, the same should be removed with the help of the scientists and carefully stored.

(iii) Transportation

The transportation of the dismantled material from the old to the new site is also an important stage. Since some of the stone objects are likely to get damaged in the process of handling and transportation, adequate arrangements for careful handling of the objects have to be made. During actual transportation, sufficient padding or cushions may be provided in the vehicles engaged on the job.

(iv) Stackyard

The dismantled objects should be stored in the godown in a most systematic manner because even a slight lapse in the proper storage of art objects is likely to create unsurmountable difficulties in the re-creation of the editice.

(v) Reconstruction

The reconstruction of the edifice should be done as per the original plan and orientation of the structure and in case of frescoes or wall paintings, they could be rearranged in the new structure with the advice and help of the experts in the field.

The transplantation of stone structures is comparatively easier than transplanting a brick structure, particularly in view of the fact that in ancient brick structures small bricks are invariably used with lime mortar and these bricks are so numerous that it is practically impossible to document them or assign them documentation numbers. Even photographic documentation in such cases, will be of no avail. Moreover the brick structures invariably have thick plaster of lime mortar, which once removed is not fit for re-use. Indeed the bricks if used in arches, domes or in sikharas of temples would pose a massive problem and the methodology used in the transplantation of stone structures could be of little avail in the case of brick structures. In the latter case the following courses can be considered for implementation of the proposal for the transplantation:

(i) To lift the entire structure by means of foreign technology from the original site to the new abode, using the latest machinery and expertise involving primarily horizontal boring.

(2) To dismantle the original structure in blocks and to re-assemble them at new site.

(3) To dismantle the structure brick by brick and then re-erect it at the new site.

The shifting of wooden structures may not pose much of a problem because dismantling of a wooden structure is comparatively easier than brick or stone structures. Lastly, the site chosen for reconstruction should be, as far as possible to identical to the original site. For instance a temple on a site situated at the confluence of two rivers should be reconstructed only at such a site where two rivers meet. This is a very important aspect of reconstruction and on no account is to be neglected.

5

Environmental Development

(i) Soil Erosion and Safeguards

The environmental development of the ancient edifices is an important aspect which contributes considerably towards their preservation and conservation. This environmental development envisages the conservation of soil around the edifices, particularly those located on river banks, sea shores, or mountaneous regions. The monuments located on or near heavy river banks are prone to damage by recurring floods, or rainfall in the catchment areas which result in flooding the surroundings of these edifices. These floods or rain waters cause soil erosion, and weaken the structures to a considerable extent. The best solution to the problem of soil erosion can be the providing of retaining or strong parapet or groyne walls around these structures, making them inaccessible to the flood or sea waters. It is not enough that retaining or groyne walls are provided to these structures, but their proper maintenance and upkeep is equally important, because any breach, though negligible, could cause irreparable damage to the monuments. Thus whenever any breach or crack is noticed in these walls around the monuments, its should be plugged without delay, especially in the rainy season.

The monuments located on sea shore, are prone to two types of dangers, firstly the sea breeze infested with saline contents and the tidal waves. In order to remove the ill effects of the saline water or sea breeze, extensive chemical treatment is required. The monuments at Mahabalipuram, Konark and Elephanta are the best examples, where regular chemical treatment is provided by the experts in the field by constant use of preservatives. The case of the shore temple at Mahabalipuram has been somewhat different, because it is too close to the sea shore and the erosion of the soil had endangered the entire structure. In order to save the structure from the sea water and erosion of the soil, reclamation work towards the temple was undertaken, by which a groyne wall was constructed in a part of the sea-shore adjoining the temple and the area was filled by means of huge prestressed concrete blocks and also boulders. This method saved the temple from the fury of waves; for the groyne wall now took the onlaught of the sea. The method worked well in saving the structure from damage to a considerable extent.

(ii) Development of Forestry, Horticulture, Botany and Floriculture in India

(a) Genesis and Evolution: Literary Evidence

Another method for the conservation of monumental edifices in the country has been to provide greenery and pleasing plants around the main structures with the twin purpose of preventing the soil from erosion and beautification, besides serving against the misuse and encroachment of monuments. Prior to 1947, these horticulture works at the archaeological monuments in the country were attended to by various agencies in the country, including the Central and State Public Works Departments. In so far as the monuments of national importance are concerned, these works at the initial stages were confined to the centrally protected monuments at Agra and Delhi and gradually these activities were extended to other monuments in the country. Currently the laying of gardens around important monuments in the country has become an essential part of the regular conservation programme.

Of course the story of horticulture, botany or forest culture in India is of considerable antiquity. No other culture bears such a deep impression of the forest, vegetation and flowers as that of the Aryans in India. Their religious books, the *Vedas* and the *Upanishads*, frequently mention about forest and vegetation. In one of the verses of the *Rigveda*, not only the forests but also the trees are mentioned: किं स्विदुन क उस वृक्ष आस: (Rv. X. 81.4). In the *Yajurveda* the term शान्तिरोषधय: and शान्तिर्वनस्पतय has been used for creepers, tree, and other elements of greenery as well as medicinal plants. In the *Atharvaveda* a large number of trees of many a usage has been described, some of which are detailed hereunder:

(i) Plants as healing agents	XIX. 38.1 (p. 41)
(ii) Plants used in a charm against a woman	VI. 50.1 (p. 142)
(iii) Arataki-tree	IV. 37.6 (p. 33)
(iv) Banyan tree	V. 5.5, (p. 21)

(v)	*Charma* with the plant *Sitaki* (*Laksha arundhati*)	V. 5.1-9 (pp. 20-21)
(vi)	Pepper corn as a cure for wounds	VI. 109. 1-3 (pp. 41-44)
(vii)	Magic and medicinal plants	VIII. 6. 1-28 (pp. 21-22)
(viii)	Plants as panacea	VI. 96. 1-3 (pp. 44-45)
(ix)	*Apamarga* plants	IV. 18. 1-8 (p. 70)
(x)	Dark plant to cure leprosy	I. 24. 1-4 (p. 17)

Besides the same text (*Atharvaveda*) also goes on to pray that the forests and plants on earth should have pleasing effect on the people:

(अरण्यं ते पृथिवि स्यां नमस्तु)

The *Brahmana* texts also did not lag behind in the admiration of trees and plants. Of these the *Taittiriya Brahamana* narrates thus:

ब्रह्मन्‌वन ब्रह्म स वृक्ष आसां यातां द्यावा पृथिवि निष्टतक्षु ।

Of the Upanishads, the *Bṛhadāraṇyaka Upanishad* 3, 9, 28/1.2.3, describes eloquently forests, trees and plants thus:

यथा वृक्षां वनस्पतिस्तथैव मृपा ।
तस्य लोमाणि पर्णानि त्वगस्योंत्पारिता बहि:
त्वच स्वास्य रुधिरं प्रस्यन्दि त्वच उत्पर:
तस्मात तदा तृण्णात प्रैति रसां वृक्षादि वाहितात
मांसान्यस्य शकाराणिं कीनारं स्नाव तत् स्थिरम् ।
अस्थि न्यन्त स्तो दारूणि मज्जा मज्जोपमा कृता ।।

The epics are, however, far more vocal about forests, horticulture and the greenery. Starting from the *Rāmāyaṇa*, it may be stated that the very inception of the epic is attributable to the forest surroundings, wherein the sage Valmiki witnessed the shooting of one of a pair of *Krauncha* birds in the forest by a hunter, and instantaneously uttered of the following verse, cursing the hunter:

मानिषाद प्रतिष्ठात्वमगमा शाश्वती समा ।
यत्क्रौंच मिथुनादंकमवधी काम मांहितम्. ।।

Valmiki *Rāmāyaṇa*.

The sage Sringi was summoned to Ayodhya from the forest by Dasaratha to perform the *Putreshthi Yajna*. The sage Visvamitra borrowed the services of Rama and Lakhsmana from Dasaratha for the subjugation of the demons in the forests; and after reaching Mithila, Rama meets Sita in a grove. Again as per the commands of his father, the two brothers with Sita had to spend fourteen years in the forests. After the exile of Sita, the rest of the drama is enacted in the hermitage of the sage Valmiki in the forests. Indeed numerous *asramas*, mainly located in forests and having groves are mentioned in the *Ramayana*, some of which are noted here:

(i) Daṇḍakāraṇya
(ii) Siddhāśarama
(iii) *Bharadvaja-āśrama*
(iv) Chitrakūta
(v) Pañchavaṭī
(vi) Sutīkshaṇa's *āśrama*
(vii) Agastya's *āśrama*
(viii) Godāvarī forests
(ix) Seashore groves
(x) Rishyasringa's *asrama*
(xi) *Saptayanasrma*
(xii) Prasavanagiri *āśrama*
(xiii) Tungabhadra groves
(xiv) Malyavān forests
(xv) Kishkindhā groves
(xvi) Madhuvana
(xvii) Vindhya *Kānana*
(xviii) Parks and groves of Lanka
(xix) Arishṭagiri
(xx) Sahya Parvata forests

Besides the above the epic also mentions the forests of the Himalayas, medieval forests, in addition to the *Sugama* (easily accessible) and *durgama* (inaccessible) forests. In the Yuddha Kandam[1] of the epic some divya[2] forests and cursed forests are also mentioned.

In the *Mahābhārata* too horticulture, floriculture and forestry enjoy prominence. The capital of the Paṇḍavas called Indraprastha was established after clearing the wild Khāṇḍava forest which contained numerous groves trees, plants, flowers and creepers. The period of exile of the Pandavas was mainly spent in forests having numerous species of plants and trees. A list of the trees and plants mentioned in the *Mahābhārata* has been appended as Appendix-XV of this work. The prominent forests, gardens and groves, mentioned in the epic are listed hereunder:

(i) Dvaita-vana
(ii) Kāmyaka-vana
(iii) Khāṇḍava-vana
(iv) Kadalī-vana
(v) Sauṅgandhaka-vana
(vi) Gardens of Dvarka
(vii) Lodhravana
(viii) Bamboo forests

(ix) Terrible forests
(x) Divine forests, *asramas* & *Tirthas*
(xi) Forests of Kailasa
(xii) Forests of Himalayas
(xiii) Sveta Parvata groves
(xiv) Gandhamadana
(xv) Malaya Parvata groves
(xvi) Various kinds of foliage available in forests

While tracing the presence of the forestry or horticulture in the Puranic literature it may be stated that the composers of these texts were fully aware of the beauty enshrined in the natural surroundings of the forests, groves or parks. This has been abundantly mentioned in all these works and it is not possible to bring out all necessary details in this work. However, in order to illustrate the above statement a list of the trees and plants mentioned in the *Vamana* and the *Varaha Paranas* is appended as Appendix-XVI.

While tracing the presence of horticulture in the ancient classical literature, one recalls Kalidasa, who refers to floriculture in verse 11 of *the Meghadūtam* thus:

कर्तु यच्च प्रभरति महीमुच्छिलीन्ध्रामवन्ध्यां
तच्छ्रुत्वा ते श्रवणसुभंग गर्जितं मानसोत्काः ।
आ कैलासाद्बिस किसलयच्छंदपाथंयवन्तः
सपत्स्यन्तं न भसि मवसा राजहसाःसहाया ।।

> "The cloud's rumbling is an indication of his consent to accept the offer of the Yaksha. The cloud seems to have been intrigued enough. The *Kandali* flowers are traditionally supposed to burst into bloom at the sound of the lowering monsoon clouds. An abundance of these flowers is a happy augury for bumper crops. The clouds need not worry for the lonely journey. There are flocks of swans, impatient to migrate to the snowy regions at this time of the year. With succulunt stalks of lotus in their beaks, the swans will keep the clouds company through all the long and weary way to Kailasa. The *Kandali* flowers are not merely comely to the eyes but are a symbol of well being, as of agricultural prosperity."

In Act-III of *Mālvikāgnimitra*, the king with the clown enters the *Pramadavana*, which is infested with the fragrance of numerous flowers blooming there.

Kalidasa's flaming love for India bordered on obsession and found expression in the exquisite description of rivers, cities, majestic trees like *Devadaruk*, *Sarela* and *Sala*. In one of his most beautiful descriptions in the *Raghuvamsa*, 2, 36 the poet gives expression to his inner most love for the preservation of the plant kingdom:

अमुं पुरः पश्यसि देवदारूं पुत्रीकृतोडसौ वृषमध्वजेन ।
यां हेम कुम्भस्तन निःसृतानां सकन्दस्य मातुः पयसां रसज्ञः ।।।।

(Yonder *Devadaru* tree that thou has been adopted as a son by the bull bannered god. It has the good furtune of having been nursed by Parvati, the mother of Skanda, from out of her own golden watering pots representing her nursing breasts.)

The same poet in the *Kumārasaṁbhava* 1.15 describes the pine (Devadaru) trees thus:

भागीरथी निर्झरसीकराणा बोढा मुहुः कम्पित देवदारूः
युद्वापुरन्विष्टमृगैः किरातैरसिव्यतं भिन्नाशखन्डिवर्हः ।।

"With pearly dewdrops Ganga loads the gale that waves the dark pines towering over the vale, and breathes in welcome freshness over the face, of wearied hunters when they quit the chase."

Indeed in the *Kumarasambhava*, Kalidasa has made the minutest observation on the floral wealth of India in which he has described all the known varieties of lotus--an achievement which has been highly eulogised by many great authorities.

Bhasa, the author of play *Vāsavadattā* did not neglect forests, their beauty and gardens. In fact the scene of Act-II of *Vāsavadattā* is supposed to have been enacted in the palace garden at Magadha. There the princess is reported to be playing a ball near the jasmine bower. The scene of Act-III, is also enacted in the palace garden, with a difference that Vasavadatta is deeply brooding over past events, when a maid servant enters to disturb her. The Act-IV also has direct relation with the palace garden.

In Act-IX of the famous play *Mālatīmādhava* of Bhavabhuti the beauty of various types of trees and plants has been described in the following piece of prose:

एताश्चदनावकर्ण सरल पाटला प्रायः तरूगस्नः परिणत
मालूर सुरमयोऽ रण्यगिरि भूमयः स्मारयन्ति तरूणकदम्ब
जम्बू वनावबद्धान्ध कारगुरू गिरि निकुञ्जगुज्जद्रम भी रगद्रदां द्रारघोरघोषण
गोदावरी मुखरित विशाल मेखलामुवां दक्षिणारण्य भूधरान ।

Bharavi in relation to Arjuna's penance for the procurement of the *Pāśupata* weapon describes the forests in considerable detail. In Chapter-V of the *Mahākāvya*, a detailed description of the Himalayas and the forests decorating the same, has been provided. The beauty of the Himalayan botanical scenery is available in the following verse:

पृथु कदम्बकराजिंत ग्रथितमालतमाल वनाकुलम ।
लघुतुषार तुषार जलश्च्युंतधृत सदान सदान नदन्तिनाम् ।।

Kirātārjunīyam 5.9

Bhattanarayana in his play *Venisamhāra* provides a vivid picture of the botanical trees and plants. In Act-II, Bhanumati is seated in the *Krīḍavātika* of the temple and the maid servant moves on to inform the queen's presence in the *Vatika* (grove) to the king. In the same Act, there is a mention of an *Abhinavavatika* in the harem besides a Bakula (मौलश्री) grove which is filled with fragrance.

In the *Nala Damyantī* play by Vasudeva, (Act-I Sec-III) the king has been equated with a gardener and all his wide realm is his garden. He has his plants to lay therein and his hedges to trim. He has to lop all wanton growth and to tend to same saplings from *Cankar*, so that the flower and fruit may be whole. He has to expend to feed the roots and quench their thirst, because on him depends all the garden's wealth.

In Act-III of Sri Harsha's play called *Nāgānanda* the beauty of the flower garden has been described where "the droppings of the sandal trees cool the creeper bower with its terraced pavements and peacocks dance to the skill sound of the shower baths."

Jainism like Buddhism is a religion of considerable antiquity and Lord Mahavira happens to be contemporary of the Buddha. The Jaina literature and art frequently mention the flora and fauna of that period. The texts while describing the distinguishing features of a Jaina figure point out the presence of the *Aśoka* or a particular tree under which Tirthankaras attained Supreme Knowledge. One of the eight *Pratiharyas*[3] consist of a heavenly tree.

Besides *Asvatha* is the tree associated with enlightenment of Anantanatha as would be evident from *Uttarapurana* (p. 117) a Jain text:

अश्वत्थ पदपोंपान्त कैवल्यमुदपीपदत्

The teeth of Suvidhinatha[4] resembled the flower buds, earning him a title of Pushpadanta. Sitalanatha had *Aśvatha* tree as his emblem according to the Digambara sect, while Svetambara sect has Srivatsa (wishing tree) for the same. Floral designs appear on many of the Jaina images as well as the *Ayagapattas* and miniatures of Jaina *Kalpasutra* and other manuscripts from Gujarat and other places.

The above account highlighting the presence of botany and horticulture in the ancient classical literature is only illustrative and not exhaustive. Besides Dhanvantri, the pioneer in the Indian system of medicines, has dealt with precisely the trees and plants, having medicinal effects which can cure diseases.

(b) *Archaeological Evidence*

Before the Aryans appearing on the Indian sub-continent, Punjab, Sindh, Rajasthan and Gujarat had an urban civilization which had been flourishing on prosperous agriculture powered by bullocks. While wheat, barley, peas and sesamum were their food crops, they also cultivated date palms. The Harappan culture too was quite familiar with botany and horticulture in as much as a number of seals were discovered from Harappan sites portray shrubs and trees. For example, in seal No. 522 from Mohenjodaro, a human is shown seated on a tree with a tiger below. This is quite a familiar subject on the seals of Mohenjodaro. The same type of projection also appears on the clay amulets.[5] In view of its frequent occurrence, it undoubtedly illustrates a legend connected with a tree which was quite popular. In seal[6] No. 430 from the same site a tree goddess or spirit, in a pipal-tree as shown by the shape of its leaves, appears to a kneeling worshipper behind whom stands a human headed goat. In the register below, there are seven ministrants or votaries, each dressed in a short kilt and wearing a long pig tail with a spray of leaves or a feather in their hair.

The tree spirit is apparently nude but has a pair of horns, between which there is a projection. The trees on seals 509 and 522 in which a man is seated appears to represent some kind of acacia. Upon one side of the round thin seal[7] No. 604, a very conventionalized tree is carved, which is almost impossible to identify and exactly a similar type was found over another seal about the presence of a pipal tree. Besides the trees depicted in seals 23b, 24b, could be *neem* trees since the leaves hang downwards. The *neem* tree is still regarded as sacred in many parts of India. Its leaves are supposed to repel snakes and they are eaten to cure various ailments. It is also believed to be the dwelling place for deities, especially the godlings of disease. Fragment of a stone disc was discovered from Rupar (600 B.C.) in which a female is shown standing besides a hut of leaves located under a *pipal* tree. *Fig. 1*

Harappan culture was succeeded by later cultures, the evidence for which is available in various post-Harappan or historical sites. The evidence from these sites also suggest the presence of botany in one or the other form. Indeed the Neolithic Society was mainly an agrarian society.

The early specimens in the sculptural art in India take us to the Mauryan period. During this period Asoka raised massive columns. On the abacus of some of these columns sometimes are found honeysuckle designs or geese holding lotus stems in their beaks. *Fig. 2* Of course during the early stages of Buddhism, the Buddha was not worshipped in a human form and mostly he was revered by his devotees in the form of an empty throne placed under the Bodhi tree. This aspect can be witnessed in abundance in the art of Sanchi, Bharhut and Amaravati.[8] Besides other botanical scenes can also be seen there.

A scene from *Syama Jataka* depicted in a panel on the Sanchi Gateway is enacted in a forest. The forest is also portrayed in the story of *Mahākapi Jātaka* over the gateway of Sanchi. In this scene too the trees bearing flowers and fruits can be seen. Another[9] panel from Sanchi is divided in four compartments, depicting beautifully the ancient types of gardens. The entire panel is filled with flowering as well as fruit plants. *Figs. 3-5* There are several other panels at Sanchi which portrays trees, garden or forests.

In the art of Bharhut and Amaravati the *Kalpalatā* (wish fulfilling creeper) and the floral designs are conspicuous by their presence on several panels. Indeed the Buddha from his very birth was connected with the flora and fauna. He is said to have been born of his mother in a grove under Asoka tree. He went to the forest after renouncing the world and meditated under the Bodhi-tree at Bodhgaya. He then delivered his first sermon in a grove at Sarnath. *Fig. 6* He is also said to have spent many rainy seasons in the Jetanavana Vihara and Nalanda gardens. Even after his death he was worshipped in the form of Bodhi-tree. *Plate 1*

In the *Jātakas*, the tree spirits play significant role and a number of *Jātakas* stories with tree spirits have been illustrated in the Indian art traditions. These tree spirits are believed to dwell in many kinds of trees but the *banyan*, *sal*, and silk-cotton are their particular favourites. The tree is worshipped not much for its own sake, but because it is the home of the spirit. It is the spirit that lives in the tree. The tree withers and dies, but the spirit is immortal. In a panel from Bharhut, Gajalakshmi is portrayed standing over a lotus, bathed by an elephant on either side standing on a full blown lotus. *Plates 2-6*

In the Kushana art of Mathura, the women and tree motifs are abundantly found in the red sand stone sculptures. The Kushana kings Kanishka, Huvishka and Vasudeva had their capital at Parsupura (Peshawar) and also ruled over Mathura from A.D. 78-200. The leaves and flowers of Asoka (*Saraca India*) were the most popular motif with the Mathura sculptor. Numerous such sculptures are found in Lucknow and Mathura Museums where *Asoka* is shown associated with female figure. These are not dancing girls but were *vriksha devatas* or symbols of fertility who were worshipped for gifts of children by childless women.

During the age of the Imperial Guptas the art of gardening flourished. Hiens Tsiang, the Chinese pilgrim, who visited India, soon after the fall of Gupta period (A.D. 628) mentions about the botanical aspect of the landscape enumerating the trees he saw:

1. *Amla* (*Ngan-mil-lo*)
2. *Madhuka* (*mo-to-kia*)
3. *Bhadra* (*po-ta-lo*)
4. *Kapitha* (*kie-pi-ta*)
5. *Mocha* (*mau-che*)
6. *Narikela* (*na-li-ki-lo*)
7. *Panas* (*panna-so*)
8. *Wild palm* (*nai*)
9. *Apricot* (*hang or mui*)

The lotus has its own importance in the religious art of India, in as much as most of the deities were shown standing, seated or even holding lotuses in their hands. The lotus also started appearing in the temple art of the country and walls and doors, jambs or even door lintels were decorated with lotus.

Before the ascendancy of the Mughals, the history of gardening in India is almost blank except for a solitary instance of Feroze Tughlak, who reigned between A.D. 1351 to 1388 and greatly improved the city of Delhi and its environs by planting gardens. His biographer testifies that the Sultan had a great taste for laying out of gardens which he took pains to beautify.[10]

However, Babur, is considered to be the pioneer of Mughal gardens in India. Before his becoming the ruler of India, Babur found time in Kabul to indulge in his favourite hobby of gardening. The following ten gardens are stated to have been laid by him:

(i) Shahr-ara (town adorning) which contained very fine plane trees
(ii) The Charbagh
(iii) The Bagh-i-jalu-khana
(iv) The Aurta Bagh (middle garden)
(v) The Saurat Bagh
(vi) The Bagh-i-mahtab (Moonlight garden)
(vii) The Bagh-i-ahukhana (Garden of the deer house)
(viii) Three other smaller ones.

In A.D. 1508-09, he laid out a garden known as Bagh-i-wafa near the fort Adinapur which he described thus: "The garden lies high has running water close at hand and a mild winter climate. In the middle of it, a one mile stream flows constantly past the little hill on which are four garden plots. In the South-west part of it there is a reservoir, ten by ten, around which are orange trees and a few pomegranates, the whole encircled by a trefoil-meadow. This is the best part of the garden, a most beautiful sight when the oranges take colour. Truly that garden is admirably situated."

In a painting from Babur-Nama preserved in the National Museum, the scene of Bagh-i-wafa has been beautifully portrayed. On the top of the painting is Koh-i-Safed, the snow covered mountain. Below is the *Char-bagh* divided into four plots in which oranges are growing. A plantain and two cypresses grow in one of the plots. In another painting Babur is shown supervising the laying of garden by the gardeners. In the background are trees laden with oranges and pomegranates.[11]

On settling down at Agra Babur's first concern was to raise a garden where he could take refuge from heat and dust. He was disgusted with the disagreeable aspect of the country, the flat monotonous dusty plains of Agra. He not only laid a garden for himself but also encouraged his nobles to do so. In his memoirs, he records the laying out of a garden on the bank of the River Jamuna, presently called Ram Bagh:

"It always appears to me that one of the chief defects of Hindustan is the

> want of artificial water courses. I had intended, wherever I might fix my residence, to construct water-wheels, to produce an artificial stream, and to lay out an elegant and regularly planned pleasure ground. Shortly after coming to Agra I passed the Jamuna with the object in view and examined the country to pitch upon a fit spot for a garden. The whole was so ugly and detestable, that I repassed the river quite repulsed and disgusted. In consequence of the want of beauty, and disagreeable aspect of the country, I gave up my intention of making a *charbagh*; but no better situation presented itself near Agra, I was finally compelled to make the best of the same spot. I first of all began to sink the large well which supplies the bath with water; I next fell to work on the piece of ground on which are the *ambli* (or Indian tamarind) trees, and the octangular tank; I then proceeded to form a large tank and its enclosure; and afterwards the tank and *talar* (or grand hall of audience) that are in front of the stone palace. I next finished the garden of the private apartments, and the apartments themselves after which I completed the baths. This way, going on without neatness and without order, in the Hindu fashion, I however, produced edifices and gardens which possessed considerable regularity. In every corner I planted roses, and narcissuses regularly, and in beds corresponding to each other."[12]

Babur's son Humayun (A.D. 1530-1554) lived in one of the garden palaces of his father at Agra, but he was comparatively disinterested in the creation of gardens. Though occasionally he visited his orange gardens, making long journey to the mountain passes to do so, he was not so much interested in botany or gardening like his father. But after his death he was laid to rest in the tomb built by his queen Haji Begum at Delhi. This is now known as Humayun's tomb and is remarkable for the contrast of red sandstone and white marble. The surrounding layout was perhaps started during the lifetime of the emperor and this is the earliest surviving plan of Mughal garden. It takes the *Charbagh* motif and enlarges and repeats it in an intricate pattern; it is almost wholly two dimensional and strongly Persian in character. The channels and tanks have the depth of mere engravings, but minute differences of level are created in order to exploit the ripples of water. This supply was lifted from wells outside the garden.

Flowery designs were also reflected in the stone walls of Mughal edifices. *C.Plate 1* For instance the *Durgah* of Sheikh Chishti at Fatehpur Sikri preserves the fine *jali* work of flower pattern, which has a soothing effect on the eyes.

Akbar was the first Mughal emperor to enter the Kashmir valley. At Srinagar, close to the Dal lake he planned a large garden, Nasim Bagh. The walls, fountains and irrigation channels of this garden have disappeared, but the *chinars* still remain. It is generally believed that *chinar* was first introduced into Kashmir by Akbar, but the fact that the locals call it *Bhuni*—a corruption of *Bhavani*—blissful-mother—shows that it was already present in the valley. *Akbarnama* mentions that Akbar took thirty-four persons inside the hollow trunk of an aged *chinar*[13] tree. *Chinar* infact is the state tree in Kashmir and its leaf-design can be seen in embroidery, carpets, wood-carving and even in brass-work. No one can fell a *chinar* tree without the permission of the Government. There is a *Chinar* in the old Mughal garden at Bijabehara fifty-six feet in circumference.

Mughal gardens are of two types — gardens for the pleasure of kings and the gardens intended to provide a place for the dead. The tomb gardens were laid by the Mughals for the same purpose. Akbar will be remembered for two tomb gardens. Humayun's tomb at Delhi with a garden in it was built during his reign in A.D. 1566, on the *Charbagh* plan. The most remarkable of the tomb gardens is at Akbar's tomb at Sikandara near Agra. It is laid out in *Charbagh* plan in a huge square enclosure surrounded by walls. In the centre is the tomb which was commenced by Akbar himself. The garden was planted with cypress, planes, and areca-nut palm. None of the original trees have survived.

After Akbar, Jehangir took up the reign. He too was found of gardening. He records his impression of *chinar* tree in Kashmir, in his Memoirs thus:

> "At two and a half *kos* from the city (Srinagar) in the direction of Hindustan, there is a *Chinar* tree in the village Rawalpur. (Its hollow) Inside is burnt out. Twenty years earlier I had myself entered the (hollow) mounted along with five caparisoned horses and two domestic servants. (But) every time this incident was mentioned the listeners showed signs of scepticism. (Therefore) I again ordered some of the men to enter that (hollows) and it turned out to be exactly as I had thought."[14]

Jehangir (1605-1627) is credited with laying the gardens at various places in India. Some of the gardens were laid during his reign are listed below:

1. Shalimar Bagh, Kashmir
2. Achabal, Kashmir

3. Verinag, Kashmir
4. Nishat Bagh, Kashmir
5. Garden at the tomb of I'tmad-ud-Daula, Agra
6. Wah Bagh, Hasan Abdal, Rawalpindi
7. Khusru Bagh, Allahabad
8. Lake Palace, Udaipur
9. Shahdra, Lahore

Jehangir laid out the Shalimar garden at the site of the villa of Pravar-Sen II, (A.D. 79-139) and founded the city of Srinagar in A.D. 1619. Connecting the garden with the waters of Dal lake is a canal about 36 feet wide. On each side are green pathways shaded by giant *chinars*. The garden is divided into three parts, the outer garden, the central or emperor's garden and the inner ladies garden. The outer garden was open to the public and terminates at the large pavilion, the *Diwan-i-am*. The emperor's garden consists of two shallow terraces with the hall of private audience in the centre. The snows of mountains provide a grand background to the pavilion in the ladies garden. According to Villiers Stuart "a subtle air of leisure and repose, a romantic indefinable spell, pervades the Shalimar with its dim vistas, smooth sheets of falling water and canals with calm reflections." This garden bears an eloquent testimony to the emperor's landscape and fine taste.

Nishat, the Garden of Delight, was built by Asaf Khan, brother of Nur Jehan. From the shore of the lake, its twelve terraces rise dramatically higher and higher to the mountain side. Each terrace represents a sign of the Zodiac. At the head of every waterfall is a stone or marble seat. At the sides are cypresses and *chinars*. Iris, narcissus, daffodils and roses were grown in profusion.

Gushing out of a limestone mountain on which a forest of Deodars is growing is a spring of clear water which is the life and soul of Achhalbal garden. The garden is laid out in terraces and is planted with apple, pear, plum, apricot, and cherry. There are also stately *chinars* for shade. A pavilion with rich cedar wood work presides over the canal which issues from the mountain spring.

Wah garden at Hasan Abdal near Rawalpindi was built around the springs by Jehangir. This palace garden was used as an imperial camping ground on way to Kashmir.

Verinag, deep spring, the source of the Jhelum river, also attracted the attention of Jahangir. In 1609, he built there an octagonal tank round the spring flanked by twenty-four arched recesses. The emerald green spring swarms with carps which are considered as sacred. The water from the spring flows into a canal and at its sides, a garden was laid.

The tomb of I'tmad-ud-Daula at Agra built by Empress Nur Jehan for her father, besides preserving a beautiful garden, also has inlay work on its walls which project flower patterns and cypress trees, plants, etc.

Jehangir died in A.D. 1627 in the mountain pass above Verinag. His last wish was that he might be brought back and buried by the spring. As winter was approaching and the passes could be closed by snow fall, his body was carried to Lahore and laid to rest in a tomb at Shahdara, where a garden was also laid. Indeed Jehangir was the greatest garden builder in India. The romantic beauty of his Kashmir gardens has contributed enormously to the aesthetic reputation of the Mughals. Wherever he stayed for long, he left a garden for posterity to admire.

Emperor Jehangir's relations with his sons, more so with the prince Khusro, were not quite congenial. Khusro was quite popular and commanded love of the public at large. Both Jehangir and his third son Khurram (Shah Jehan) saw in Khusro a threat to their own security and the prince's rebellion was put down with barbaric cruelty. His death was contrived by Shah Jehan and Asaf Khan, in whose custody he had been placed. After his death, the body of Khusro was brought to Allahabad and was buried at Khusro Bagh, a terrace garden tomb where he lies with his mother and sons. Inside the tomb there are beautiful stone carvings displaying trees, plants and flowers in quite a tasteful manner.

The pleasure garden of Nur Jehan at Shahdara, Lahore was known as *Dilkhush* garden. Jehangir visited this place during his life time, and he was buried there after his death. Nur Jehan designed his tomb on the pattern of I'tmad-ud-Daula, her parents burial place at Agra. There is an outer courtyard which served as a serai where the travellers could rest for the night. A tall gateway gives access to the inner garden which contains the tomb. The enclosure is on a huge scale with fine interlocking patterns of raised causeways, canals and tanks in which bricks have been beautifully used. *C.Plates 2-8*

Shah Jehan succeeded Jehangir and remained emperor of India from A.D. 1627 to 1658. A great builder, Shah Jehan raised a number of monumental buildings, viz. the Fort and the Taj at Agra and the Red Fort at Delhi. The Red Fort, Delhi contained a magnificent garden which was irrigated by a canal, drawing water from the Yamuna, which at that point of time flowered quite close to the fort. Water flowed through a channel lined with marble. This channel known as Nahr-i-Bihisht ('stream of paradise') passed underneath a carved marble screen of great beauty bearing a representation of scales of justice. During his life time Shah Jehan laid the following gardens in the country:

(i) Dara Shikoh, and Pari Mahal, Kashmir
(ii) Chashma Shahni, Kashmir
(iii) Charchinar Island, Kashmir
(iv) Shalimar Bagh, Delhi
(v) Lahore Fort
(vi) Shalimar Bagh, Lahore
(vii) The Fort, Agra
(viii) The Taj, Agra.

The most delightful creation of Shah Jehan was the Shalimar garden of Lahore, which was laid out in A.D. 1634 under the direction of Mardan Khan, the architect of Chashma Shahi garden at Kashmir. Shalimar is a garden of great beauty characterised by balance and symmetry. The garden was laid out in seven divisions, symbolising the seven stages of paradise, according to the Islamic concept. In the second terrace towards the east are royal bath rooms which consist of arched chambers with beautiful reservoirs which were heated by fire wood from outside. The central terrace consists of a huge tank with marble pavilions on three sides. In the centre is a platform reached by narrow stone causeways. A canal flows from the middle terrace into a large marble basin. From the canal and the basin rise four hundred and fifty jet fountains which fill the air with soothing spray. Pavilions and summer-houses of marble and red stone are scattered in the garden. Shalimar suffered considerable damage in the last quarter of the eighteenth century as a result of the confusion caused by the fall of the Mughal empire. Copper of its fountains found its way to the market, marble was dismantled and transported to Amritsar for the sacred tank of the Golden Temple. In A.D. 1806 Maharaja Ranjit Singh[15] stayed here after a short illness. He got the canals and the channels reopened and cleansed. During the British rule the garden became a public place.

Shah Jehan created a great garden around the Taj at Agra, which enshrine the remains of Mumtaz Mahal, his queen. The garden is of *Charbagh* pattern, a four fold plot, with a tank of white marble in the centre. The irrigation canal which contains fountains, had cypresses which columns mounted on harmonised with four minarets. The proportions of the garden have undergone a great change during the last century and subsequently. Besides the profuse

C.Plates 9-10

display of the horticulture in the entire Taj complex, the place has the distinction of preserving flower patterns in the inlay works on the walls of the tomb and the graves. On a frieze or flowers at the base of the outside walls of the Taj, Tulips and iris are clearly seen besides imaginary plants resembling Dillenia. Besides flower patterns were also introduced in the marble lattice work, which served also to percolate diffused light in the interior. Similar type of inlay work showing flowering patterns, also appear on the wall of the Naubat Khana, Diwan-Khas and other places at Red Fort, Delhi. *C.Plates 11-16*

Aurangzeb's contribution towards bringing out gardens was minimal. At Lahore, Aurangzeb's Badshahi mosque is unusual in having a garden while in the Red Fort he built Moti Masjid with flower patterns on walls. His daughter Zebunissa Begum is said to have built two gardens at Lahore, known as Chauburgi Bagh and Nawam Kot Bagh, but no traces of the same are forthcoming. Roshan Ara Begum, the daughter of Shah Jehan, also laid a garden at Delhi, which was treated as her pleasure garden. Aurangzeb's foster brother laid out a garden at Pinjor near Chandigarh. *C.Plates 17-21*

In spite of his being an orthodox ruler, the floral beauty could not be neglected by him because the Moti-Masjid in the Red Fort, Delhi has enough of such motifs.

The salient features of a Mughal garden are: the trees, shrubs, plants, flowering herbs and constant and regular water supply, which provides a soul to it. These requirements were well looked after in the Mughal period. These gardens are now a much neglected lot with the tanks, canals and water channels remaining dry or choked, and most of the trees which were originally planted having died out or replaced.

The details of plants grown by the Mughals are available in the biographies of the Mughal emperors. (A list of the same is available at Appendix-XVII). They mostly planted mixed avenues of cypresses and flowering trees like white flowered variety of *Kachnar* (*Bauhinia Variegata*) or the orange or lemon trees. In Kashmir, the plum or the apple trees were grown in place of oranges and *Kachnar*. Bordering the square plots were pomegranates and oranges. Oranges, pomegranates, almonds, plum and white *kachnars* are symbols of youth and life whereas cypress symbolise death and eternity. The dark green cypresses provide a solemn background to the silvery sprays of plums and the pink blossoms of almonds, the emblem of youth, life and hope. The Mughals mostly planted the spring, flowering trees, shrubs and herbs in their gardens. They grew white, purple and mauve iris near liliac bushes, daffodils and narcissi under apple and quince trees, and tulips under pear and plum trees in their Kashmir gardens. In summer, they grew roses, carnations, jasmines, holly hocks, peonies and dolphiniums. Sometimes, the flowers of one variety were massed in a garden thus creating a beautiful colour effect.

The use of flower patterns was not restricted to the temples and mosques. Christian art in India was also influenced by the same. Many Christian churches in the country adopted immensely decorative floral pattern which could be rated among the best not only in the country but also the world over. *C.Plates 22-29* These motifs though created under foreign influence, still portrayed the involvement of Indian artists and artisans, who while working on such edifices could not forget the traditional art, which was handed down to them from their ancestors. The pillars in the Dolly Jesus Church at Daman and the other churches in Goa and other parts of country stand testimony to the same.

All the above evidence goes on to bring home the point that our ancients were well aware of the fundamentals of horticulture, botany and forestry.

The foregoing account has discussed to some extent the evidence of horticulture, botany, floriculture and forestry in the Indian plastic art from the earliest times. But the evidence so produced is only illustrative and not exhaustive, because the scope of the same is quite wide and would require an exclusive work to highlight the subject in detail. Much in this respect is still to be said.

(*c*) *Archaeological Gardens in Modern Times*

In so far as the development of horticulture around the monumental edifices during the modern times is concerned, it may be brought out that these activities could be divided into two distinct categories viz., (i) the ancient gardens already attached to the monuments, like the Taj and Akbar's tomb at Sikandara at Agra and Humayun's tomb and Safdarjung's tomb at Delhi; and (ii) the sites where the gardens and lawns have been developed afresh for the improvement of their environments. In this connection it may be recalled that the works relating to the development of gardens and lawns around the ancient monuments, prior to 1947, were looked after by the Central or State Public Works Departments. These works were initially confined to some major monuments at Agra and Delhi, but it was gradually realised that these gardens were losing there ancient grandeur and sometimes getting out of context. The main purpose for the development of a garden around an ancient edifice is to improve its environment, which should be conducive to the personality of the edifice concerned. This essential touch was lacking in the handling of the horticulture works by the Public Works Departments.

In order therefore to preserve and develop the gardens initially around the ancient monuments at Delhi and Agra, on archaeological principles, these works were taken over by the Archaeological Survey of India. These were mostly Mughal gardens and were developed accordingly. Gradually the lawns and gardens at some of these monuments were turned into deer parks with various kinds of flora and fauna. The deer park at Akbar's tomb Sikandara and Sarnath stupa site could be cited as examples of this type. The gardens and lauwns around the centrally protected monuments were once considered to be quite prestigeous and impressive ones and were decorated with beautiful flowery beds pleasing to the eyes, and the visitors carried an everlasting memories of the same. This type of arrangement is however, vanishing rapidly.

However, while conceiving the idea of the development of horticultural works around ancient edifices it has to be kept in mind, that the arrangement of lawns, flowers and planting of the trees etc. should be conducive to the character of the edifice concerned. As for example, the planting of the cypress trees could be quite suitable for tombs or graves, but not for temples, monasteries and dwelling houses.

(*d*) *Arrangements of Gardens at Archaeological Sites*

The gardens or horticulture works at the archaeological sites are maintained or developed by the concerned Archaeological Departments. But while doing so, one has to keep in mind the following points while dealing with such horticultural works:

1. These horticultural works are carried out at the ancient sites/monuments which were constructed centuries ago and special efforts should be made to ensure that the development of these horticulture works does not in any way cause injury to these edifices, by creating dampness or seepage of water, etc.
2. Because of the ancient nature of the edifices, the digging or excavation of soil around the monument should be carefully executed and the use of heavy machinery or bulldozers is prohibited
3. The blasting of rocks in the vicinity of the monuments has to be avoided because such an action could weaken or endanger the very structure or even the foundations of the edifices.
4. Horticulture works sometimes are carried out at the monuments located in deserts, out of the way or inaccessible localities, where no

> water supply might be available and for carrying out these works special arrangements for the purpose, like digging of deep tubewells have to be made. Sometimes the water supply for irrigation purposes has to be arranged by means of erecting water channels from the nearby canals.

The main objective for the execution of horticulture works around the ancient monuments is to develop them and improve their environments. For this purpose it is essential to regulate the entry and exit of visitors to these edifices as well as the gardens and lawns, otherwise the visiting public might trespass at will and disfigure them. To avoid this situation, it would be necessary to arrange approach roads and pathways. Besides all the gardens and lawns around the monuments are to be suitably and effectively fenced.

The choice of plantation of shurbs and trees in the gardens around monuments is quite a complex problem and one has to be quite selective in this regard. The pattern of plantation in mosques and tombs would be different from those in the temples and monasteries. The pattern of flowers and plants in the beds around Mughal monuments have been defined by the biographers of the respective emperors; these could be adopted in the present day gardens around tombs and mosques.

NOTES AND REFERENCES

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2. *Ibid.*, Yuddha Kāṇḍam, 4. 48.
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4. *Ibid.*, p. 46.
5. Mackay, E.J.H., *Early Indus Civilization*, p. 337.
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8. Fergusson, James, *Tree and Serpent Worship in India*, Pl. XXXVI, 1 & 2, p. 187.
9. *Ibid.*, p. 139, Pl. XXXVII, Fig. 2.
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13. Fazl Abul, *Aine Akbari*, Trs. by Blackman and Jarret, Calcutta, 1873-94.
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6

The Antiquarian Laws

The Indian subcontinent has served as a confluence of cultures emerging out of religious beliefs as well as external forces, which from time immemorial had been flooding the country particularly from the northern as well as northwestern horizons and occasionally from the sea. These forces resulted in developing institutional art and architecture in the form of structures based on (i) respective religious thought, (ii) need for proper fortification of the royal troops, rulers and their families, besides (iii) the desire of the rulers of the times to project their supremacy or might, etc. in the eyes of the general masses. These monuments have come down to present times as vestiges of the past representing our cultural heritage, and are available mostly as outstanding specimens of art and architecture, viz. stupas, monasteries, railings, temples, tombs, mosques, forts, palaces, etc. These monuments presently are (i) under the charge of the Central Government, (ii) State Governments, (iii) religious institutions and occasionally (iv) under private ownership too.

These vestiges of the past provide great attraction to the visitors, scholars as well as the tourists, not only from the country but also from foreign lands. While visiting these monuments one usually comes across the security staff on duty, as well as protection notice boards intending to caution the visitors that the monument which they are visiting is protected by law and the damage done to it by anyone would attract penal provisions under the law. In spite of these measures vandalism in one way or the other at such places is not an uncommon sight, the mildest mode of which would be the inscribing by the visitors their names on the walls or any other accessible spots in these monuments.

These monuments were built centuries ago. Though innumerable examples of the destruction of monuments by invaders or converting them to places of opposite faith by the rulers of the times would be available, still the type of vandalism currently practised at these monuments which include removal of the artifacts for commercial or even monetary gains, was relatively unknown a few centuries ago. By and large the common man in the remote past could hardly conceive the idea of harming religious places or any other vestiges of the past because of the religious commands or the royal orders against such actions. The enactment of penal laws providing material punishment, for the above offences were almost absent in bye gone days. But the protection of the edifices was almost ensured by making the act of vandalism or misappropriating the funds meant for the maintenance of these edifices a moral or religious offence rather than a material one.

A peep into the ancient Indian literature and epigraphical records would provide glimpses of the treatment meted out to the defaulters in such cases and the types of sacred or moral commandments, prescribed in those times.

(i) Glimpses of Ancient Antiquarian Laws/Rules

The genesis of antiquarian laws could therefore be traced back from the Mauryan times, when it was ordained in the Sarnath Pillar inscription of Asokan times, that whosoever tried to destroy or damage the Sangha would be excommunicated with white robes on him. Thereafter several inscriptions carry the following themes:

1. *Asokan Sarnath Pillar Inscription*: "You should act in such a way that the Sangha cannot be divided by any heretical monk. Both the Sangha of the monks and Sangha of the nuns have each been made by me a united whole to last as long as my sons and great grandsons shall reign and the moon and sun shall shine. The monk or nun who shall break up the Sanghas, should be made to put on white robes and to reside in what is not fit for residence of a recluse."[1]

A few of innumerable such examples are produced hereunder:

2. *Danapalayuramadhye, Danat Sreyonupalanam, Danat Svargamavapnoti, Palanad Achyutam Padam: Samanyoyam Dharmasetur nripanam Kale Kale palaniyu bhavadbhih* etc.[2]
   (Between the act of donation and protection the latter is better, because by the former one gets the heaven, while with the latter one gets infallible place).
3. An epigraph from Mulaguda (Karnataka) dating back to A.D. 1062 records the gift of land attached to the Nagesvara temple by the

settis, *gamundas* and others, and further stipulates that the grant should be protected and prescribes all merits to those who would protect it and ensure the welfare of the *matha* for years to come.[3]

4. An inscription of the reign of Chalukya Somesvara IV, of twelfth century A.D., refers to a grant made on the occasion of solar eclipse to the deity *Ramanathadeva* by *mahapasayita Bhaga-gavunda*, described as right hand (*Baladi-kai*) of *Mahamandalesvara Chatta-nripa*. The recipient of the grant was Kedar Panditadeva and the purpose of the grant was besides usages, the *jirnoddhara* of the temple. It also states that the person who protects these grants would attain merit of donating a thousand cows at Varanasi to Brahmans, who are *Vedaparagas*.[4]
5. A bilingual record of the reign of Muhammad-bin-Tughluq Shah of the Tughluq dynasty from Karkhadi in Vadodara District of Gujarat, states that in accordance with the order issued to Malik Mujaffar by the king, after the settlement of some issues, a mosque and a well were constructed in the village Karkari (Karkhadi) in the District of Baroda (Vadodara) by Mokha Mehta, son of Keta Mehta Hindi (i.e. Hindu). It ends with an imprecation that whosoever violates this gift of the mosque and well, would face the displeasure of the Exalted Almighty on the day of judgement.[5]
6. A Tughluq record from Khambhat (Cambay), District Kheda of Gujarat, States that a mosque was built in A.H. 755 (A.D. 1354) in the reign of Firuz Shah by the Kutwal of Khambayat (*Khambhat*) whose name is lost but whose title *Quaran Khawan* is legible. It ends with an imprecation that any one who destroyed the mosque or misappropriated the endowment would incur the curse of Allah, the Angels and the people.[6]
7. A bilingual epigraph from Sathod in Vadodara District, dated A.H. 785 (A.D. 1383) and belonging to the reign of Firuz Shah Tughluq, states that Dungarsi Tikan and Natha who had carried out repairs to a ruined step-well were endowed with a tract of cultivable land and were invested with the right of cultivation on 16 *bighas* of land and sowing such crop, whether Rabi or Kharif, as they liked for the proper upkeep of the well. It imprecates that anybody who caused obstruction, his wife would be deemed to be divorced and he, as having violated the pledge to God and His Prophet.[7]
8. A Bahmani epigraph, dated A.H. 904 (A.D. 1498-99), from Raichur,

headquarters of an eponymous district in Karnataka, registers a deed of endowment made by *Malikush-Sharg Malik Haji* son of Sulaiman Qirmani, of 9 *Chawars* of land in the village Gabur in Raichur district—8 *Chawars* for the managing trustee of the mosque and also of 40 shops in the city of Raichur near the monument for meeting the expenditure incurred on the mosque. It further stipulates that any person who made any change in or mis-appropriated this bequeathed property would be liable to curse.[8]

9. An epigraph, dated A.H. 919 (A.D. 1513) from Kondangal, in Mehaboobnagar District of Andhra Pradesh, states that under orders of Malik Qutbul-Mulk (founder of the Qutub Shahi dynasty), two hamlets namely Oler Buzurg and Oler Kuchak were coalesced into a single town named Hussainabad and endowed for the purpose of providing a public kitchen (*langar*) for the poor and the needy in honour of the twelve Shiite Imams. It adjures all persons, whether a common man or an official not to interfere with the endowment in any way, failing which he would incur the curse of God, of the Angels, of the Messengers (of God), and of all the created beings from the first to the last and would be black-faced in this world and the hereafter and would be deprived of the intercession of Muhammad, the Prophet of God, on the day of Resurrection.[9]
10. A record from Kembhavi, in Gulbarga District of Karnataka, dated A.H. 935 (A.D. 1529) in the reign of Kalimullah Bahamani, refers to the construction of a tomb and a mosque by one Haji (name lost) and endowment of shops, etc. for their maintenance. It ends with an imprecation that those who sought to violate the terms of the deed or spend the income otherwise, would incur the wrath of God and His Prophet.[10]
11. An inscription from the Archaeological Museum at Bijapur, dated A.H. 967 (A.D. 1559) in the time of Ali Adil Shah I, states that Khan-i-Azam Jannat Khan, the Naib-i-Ghaibat, endowed five shops constructed by him for meeting various items of expenditure incurred for the upkeep of the mosque of Aminul-Mulk. It ends with an imprecation that whosoever opposed it or caused any damage to the said shops would be liable to the curse of God, detestation by His Prophet and deprivation of the intercession of the (Twelve) Imams.[11]
12. An inscription from the Archaeological Museum at Bijapur, Karnataka dated A.H. 947 (A.D. 1540), states that two gardens and

two *chawars* of land were endowed for the maintenance of a mosque. It ends with an imprecation that whosoever coveted it, would be liable to the curse of God.[12]

13. A Mahdar (Decision-by-Assembly) from Hukeri in Belgaum District, Karnataka, comprising the text of an agreed deposition made by the Mahajan and the Balutas of the town runs to the effect that the *chawar* of land was endowed for the maintenance of the Karanja (Water-Storage Tank) and Guest-House built by Mansur Khan for public use and that Mansur Khan entrusted the land for cultivation to a local resident Miran, son of Hasan. It adjures the violators of the agreement, condemning the Muslims among them to having committed the sin of embracing Christianity and the Hindus to having committed the sin of killing and eating a cow and indulging in fornication at Varanasi or Kashi.
14. An epigraph from Hyderabad, Andhra Pradesh, dated A.H. 1067 (A.D. 1657), records the bequest of some houses and shops for the maintenance of a mosque. It also contains an imprecation that any one who lays claim to these houses and shops, if she be a woman, would have been deemed to commit adultery with her father in the sacred precincts of Mecca, and if a man, would be deemed to commit adultery with his mother in the same precincts.[13]
15. An epigraph from Golconda, District Hyderabad, Andhra Pradesh, dated A.H. 1084 (A.D. 1673) in the reign of Abdullah Qutb Shah, reports the endowment made ten years previously of Mongalwaram in the division of Janwal popularly called Hasanabad for the *Langar* (free-kitchen), reciters of the *Quran* and attendants of the Tomb of Neknam Khan. It further states that the revenue officers and agents of the division should consider the said village as assigned and apportioned for the above expenses and anybody disobeying the order would be overtaken by the curse of God and imprecation of His Prophet.[14]
16. This record of Aurangzeb dated A.H. 1119 (A.D. 1707) from Bilgi, in Bijapur District, Karnataka, states that Nawab Diler Khan Bahadur, son of Abdul Karim Bahlul Khan Miyana (of Bankapur and Savnur), granted four *chawars* of land in the town (*Qasba*) Bilgi, in pargana Bakarkota to his servant B (V) isaji Pandit, son of Mahdaji and grandson of Babaji, a Patal Shahi Rugb (V) odi Brahmin who spent his personal earned income to excavate a step-well and lay out

a garden. It threatens that whosoever intrudes, whether a Hindu or a Muslim, with a curse of divorce.

17. A Persian inscription of Sept A.D. 1653 discovered from Madras Presidency asserts as follows:

    "Therefore, all people shall protect this mosque. Those who protect it will get the merit of making the sixteen gifts; those that cause destruction (to it) will incur the site of killing a cow at Kasi (Varanasi)."
18. A Persian Inscription from Sharpur, Bogra Distt. Bengal, dating back to 25th January, 1582, describes thus: "Why not? but the mosque is small and let heaven forbid that any violence from the people of the time should come upon you." They said "whoever intentionally or knowingly should cause it, will in turn receive the name; (but) he will feel more from the Dispenser of favours (God)."[15]
19. An inscription in Persian of A.D. 1657 from Mughalpura, Hyderabad city in Andhra Pradesh warns "if she is a woman who lays claim to these houses and shops which have been bequeathed for the mosque, she (as it were) commits adultery with her father in the sacred precincts of Mecca, and if he is a man, he (as it were) commits adultery with his mother in the same precincts.[16]
20. A Persian inscription of A.D. 1700 in a mosque near Kotla Ali Jah, Hyderabad city warns those who may think of misappropriating the funds meant for the maintenance of the mosque thus: ". . . . . and the rent of a shop with an upper apartment, which have been built adjacent to the mosque is to be spent for the matting and water and on the pay of the *mu'adhdhin* and steward and on the light of the said mosque. If the sister or brother or daughter or their children will interfere (in this bequest) the curse of God shall overtake them and they shall feel ashamed in the presence of the Prophet.

Another aspect of the protection of the monuments includes (i) providing of watch and ward staff for the safety of the monuments, (ii) measures against destruction of the monuments, their restoration, and (iii) when need be to entrust safety of the monuments to regular troops. An inscription from Srirangam provides an interesting account of the conflict between the two communities which resulted into destruction and restoration of a temple by raising loans and with the help of militia. The inscription is dated to the 11th sequential year of Rajakesarivarman Chakravartin Kullottunga I[17], and "registers the decision of the Sabha of the village Rajamahendra-Chaturvedimanglam (in Thanjavur district) for remitting the taxes on certain lands belonging to the temple of Mummudi Sola Vinnagar Alvar of their village for the consideration of a lump sum of seventy *Kalanju* of Gold. The records besides the above, mention that "in the second sequal year of the king, there was a clash between right hand and left hand communities, in which the village was burnt down, the sacred places destroyed and the images of the deities and the treasury in the temple looted by the robbers. The articles that escaped their spoilation could not be properly safeguarded in the temple. Hence as the village had to be rehabilitated, the temples renovated and reconstructed and new walls had to be built for the Prakara. The Sabha therefore took a loan of fifty *Kalanju* of gold, which is stated to have been half a carat less in fineness than the Rajendra-solan-madai from the temple. The interest on this accumulated to twenty-five *Kalanju* in one year. Out of twenty-five *Kalanju*, five *Kalanju* were spent towards the renovation and reconstruction of the temple in the third sequal year and the balance of twenty *Kalanju* was utilised for purchasing and making tax-free some specified lands for the upkeep of the temple."

(ii) Temples under the charge of Garrison or Places of Refuge

Epigraphical records also testify that some of the temples in South India were placed under the protection of the army while others had their own regular armies, and still others had high protection walls.[18] These shrines provided protection even to the local population during external aggression. For this purpose, the *Mahatantra* (which would mean great Council of army), in order to maintain an undertaking given by them, allotted one soldier from each regiment and one *Veli* of land for each such soldier for doing service in the temple. In another inscription in the Bhaktavatsala temple at Sermadevi in the district of Tirunelveli, *Munru-Kai-Mahasenai*, are represented as protecting certain charitable endowments made to that temple. In another record from Tiruvalisvaram in the same district, it is stated that the local temple, its treasury and temple servants were placed under the protection of Chola army called *mnrru-kai-mahasenai*. Similarly in another record in a temple at Sangramanallur, in the Coimbatore district of Tamil Nadu which was evidently fortified and garrisoned in olden days, the soldiers were required to protect the *gopura*, the temple and its premises.

Many temples in South India had high enclosure walls and served occasionally as forts in times of emergency, offering refuge to the residents of the locality. A Pandya inscription assigned to Rajasimha—the contemporary of early Chola-king Parantaka I—from Ukkirankottai in Tirunelveli district, which was known as Karavandopuram in those days, states that the temple was placed under the protection of *maditchevakar*, i.e. the soldiers guarding the walls or the ramparts.[19]

A late inscription[20] from Srivilliputtur in Ramnad district, also states that the *tirunvasal* (sacred entrance) of the temple of Vishnu Vedaparun-koyi-udiyam, was considered as *abhayam* (place of refuge) for the residents of the locality and certain other villages, or what was known as *anjinan-pugelidam*, i.e. place of refuge for distressed or the persons afraid.

A violent class of temple-servants called *Viramushti* or *Virabhadra*[21] was also known. It could therefore be presumed that at least some temples in South India had in those days regular militia attached to them.

A Polonnoruva inscription (in Sri Lanka) mentions the *Veliakkarer* as of *munru-kai*, i.e. three arms or hands and some inscriptions from South India, also refer to *munru-kai-mahasenai*, i.e. great army of three hands. *Valangai* and *idengai* are evidently the two arms of the army, while the name of the third arm is not found mentioned anywhere. *Valangai* — the right hand, probably represented the permanent military force of the state, while *idangai* or left hand represented the army of the merchants or the mercantile guild. The third arm could possibly be the section of militia intended for temples.[22]

(iii) Protection Notice Boards

It would thus be evident that in the ancient times not only the religious Royal Commands inscribed at the respective monuments served as "Protection Notice Boards" and also that the monuments — particularly the temples, etc. were occasionally well guarded by the regular guards and in certain cases by the temple militia or even the royal army was there to protect them.[23]

(iv) Modern Antiquarian Laws

In more recent times the advent of the antiquarian laws could be traced back to as early as the third quarter of the 19th century, when the East India Company attracted by the rich cultural heritage of the country, established in 1784, the Royal Asiatic Society of Bengal. The aim of the Society was to study, cultivate and preserve the history and culture of Indian people. The scope of the Society was further extended to the study of flora, fauna, geology, minerals, arts and crafts besides sciences and literature.

In 1814, the Indian Museum at Calcutta was established and the objects collected by the Society were housed therein.

The first antiquarian law in the true sense of the terms was enacted towards the beginning of the 19th century by the introduction of Bengal Code-XIX in 1810, followed by Madras Code-VII of 1817, which invested the executive with powers to intervene, whenever any public edifice was exposed to the risk of destruction or misuse by private individuals. Under these enactments the management of such monumental edifices passed on to the Boards of Revenue, who were to maintain them out of the earnings of land-holdings attached to such edifice. In case a particular building being in decayed condition, could not be repaired out of the available revenue earnings of the same, the Government had the authority to auction it out.

The Acts of 1810 and 1817, were repealed in 1863, making a significant departure from the earlier policy. By the enactment of Religious Endowment Act, 1863, the Government took upon itself the responsibility to prevent injury to and to preserve buildings remarkable for their antiquity, or for their historical and architectural value. In spite of its limited scope the new enactment projected the Government's interest in the protection of outstanding monumental edifices.

For the first time in 1867, it was recognised in principle that it was the duty of the Government not only to conserve all historical monuments which had been located, but also to encourage the exploration of others yet to be located. All Provincial Governments were instructed not only to prepare lists of all historical buildings under their respective territorial jurisdictions, but also have the photographic records for the same prepared. In 1870 the concept that the antiquities could be instructive only when preserved in their original context and the employees of the company were prevented from the wanton decay of the monuments. By another directive of the British Government in 1873, the Provincial Governments were informed that the responsibility of caring for the monuments of historical and architectural importance rested with them.

Indian Treasure Trove Act, 1878, provided a significant handle to enable the Government to acquire any work of art unearthed, the value of which did not exceed rupees ten. Under this Act any person finding a treasure, i.e. an object hidden in the soil or in anything affixed to the soil exceeding ten rupees in value, had to report the find to the Collector of the District and deposit the find in the treasury or give to the Collector a suitable security in lieu of the deposit of the object. If the Collector found that the treasure hidden was over a hundred years old, before the date of its discovery, he could declare it ownerless and divide the treasure or its value between the owner of the place, and the finder proportionately.

In spite of the legislative and administrative measures taken by the Government, as witnessed in the preceding notes, there was hardly any visible improvement in the preservation and maintenance of the monuments controlled by the Government. Conscious of the need of the times the Central Government released special grants to Provincial Governments in 1879, for the preservation and repair of vestiges of the past. The arrangement continued only for a few years and in 1898, a scheme was however, drawn for the setting up of the Archaeological Survey of India dividing the country into five Circles. The scheme was accepted in 1901, and Sir John Marshall took over as Director General in early 1902.

In order to assume legal authority for the protection and preservation of ancient monuments the Ancient Monuments Preservation Act was passed in 1904. While defining therein the terms 'ancient monuments', the edifices in respect of which the total responsibility for protection and preservation could be assumed by the Government was also specified. The term "antiquity" was also defined in considerable detail. Besides the method, under this Act, for the protection of the monuments was also evolved. The District Collectors were vested with powers to purchase, or take over on lease a monument with the approval of the Local Government. The Collector with the approval of the Local Government, could also enter into an agreement for the preservation of any monument. Section 10 of the said Act also provided for compulsory purchase of monuments. The acquisition proceedings in such cases could be processed under the Land Acquisition Act, 1894.

A most significant step under the Act of 1904, was that the Local Governments were vested with the authority of regulating or control of mining or quarrying operations near the monuments. Besides the Central Government was vested with the following powers under the Act concerning the Antiquities and Monuments:

(i) Powers to declare a particular monument as protected.
(ii) Powers to control traffic in antiquities.
(iii) Powers to purchase antiquities.
(iv) Powers to control movement of antiquities.
(v) Powers to notify areas as protected.
(vi) Powers to enter upon and make excavations in protected area.
(vii) Powers to acquire protected area.

A significant provision of the Act was that it provided penalty for vandalism or thefts of parts of monuments or antiquities. This Act was further amended in 1932, authorising the Local Governments to further control mining operations, etc. near ancient monuments and to prohibit the conducting of excavations without the issue of licences by the Archaeological Survey of India. This Act has been superseded by the Act of 1958. It may however be added here that the provisions of the Act of 1904, though are largely out of date now, owing to the political changes in the country, but it stood the Government in good stead for over fifty years in the preservation of monuments and regulation of excavations and allied matters.

Since the then prevailing enactments were proving ineffective to exercise control over the traffic in antiquities out of the country, a new legislation prescribing penal provisions for exporting antiquities or art objects without a licence from the Government, was brought in 1947, under the title of Antiquities (Export Control) Act, 1947. In the same year India became independent and thereafter a large number of princely states merged into the Indian Union. All these states had some monuments under their charge and at the time of merger of these states with the Indian Union, it was not considered necessary to take over all such monuments from princely states. Therefore, only such of the monuments as were considered to be of national importance were taken over by the Central Government from the princely states and the monuments of lesser or local importance were left to the care of the respective State Governments. For this purpose the Ancient and Historical Monuments and Archaeological Sites and Remains (Declaration of National Importance) Act, 1951, was brought in. This also had a reference to Section 126 of the States Reorganisation Act, 1956. With this background, the Indian Constitution made 'Archaeology' a concurrent subject, prescribing simultaneously that the maintenance of the monuments of national importance will be the responsibility of the Central Government, while the remaining monuments will be looked after by the respective State Governments.

The vast political changes emerging out of the country's independence and subsequent changes in the political systems completely outmodded the earlier antiquarian laws and it became obligatory to bring in modified legislation to suit the purpose. Accordingly the Ancient Monuments and Archaeological Sites and Remains Act, 1958, was passed followed by the Ancient Monuments and Archaeological Sites and Remains Rules, 1959. The salient features of these enactments are detailed hereunder:

(i) The Central Government assumed powers to bring the monuments of national importance under Central protection.

(ii) The Central Government may enter into an agreement with the owner of a monument of national importance for its maintenance and upkeep. In case of the failure on the part of the owner to do so the Government may assume some powers for its maintenance.

(iii) In case the Government believes that the owner of a monument intends to do something which may endanger the safety of the monument, such a person can be ordered not to do so under the Act.

(iv) The monument already in religious use can be allowed the customary use, but revival of worship is not allowed as a rule.

(v) No person is allowed to excavate, mine and quarry, etc. at a protected monument/site, but normal cultivation is allowed.

(vi) The maintenance and upkeep of the centrally protected monument of national importance remains the responsibility of the Central Government.

(vii) No modern building can be constructed over a protected site without permission from the Government. In case any unauthorised structure comes up, it may be removed by the Government at the builder's cost.

(viii) No person other than an officer of the Archaeological Survey of India can undertake excavations at a protected monument. An officer of the Archaeological Survey of India can also excavate a site not protected. In both the cases prior approval of the Government would be required.

(ix) No State Government can undertake or encourage any excavation of sites without the approval of the Central Government.

(x) The Central Government has the authority to purchase antiquities and art objects.

(xi) No meetings, conferences, parties, etc. except the recognised religious ones, are allowed in the monuments.

(xii) The preparation of drawings, and photographs of monuments are allowed, provided they do not cause inconvenience to visitors. For preparation of movie films, a licence is required.

(xiii) Offences under the Act are punishable with imprisonment of three months or five thousand rupees or both.

(A chart showing the chronological development of definition of the term "Antiquity" or "Art Treasure" is available in Appendix-I.)

After the country became independent, its doors were thrown upon to foreigners from all parts of the world and all of them were not inspired by logic of the necessity to preserve the works of art *in situ* or the sanctity for their retention in the country of origin. Some of the affluent countries would pay handsome or fabulous sums for the possession of the relics of ancient past from any country. The situation reached alarming proportions in the Sixtees when large scale thefts of sculptures, paintings, coins, bronzes, and other antiquarian remains were reported from various museums Centrally protected monuments, places of worship besides private possessions. This situation was not only a serious blow to the protection of the national heritage but also to the national prestige. It was therefore felt that a more stringent measure should be adopted to prevent the smuggling of antiquities.

Considering the drain on our cultural heritage though illicit means and smuggling, the Government of India, passed the Antiquities and Art Treasure Act, 1972 repealing the Antiquities (Export Control) Act, 1947. In view however, of the time taken for creating infrastructure for its implementation the Act actually came into force in April 1976. The Act envisages three principal functions; (a) registration of antiquities with every owner, (b) licensing of dealers in antiquities, and (c) regulating the export of antiquities. The registration of antiquities is being done through the agency of various states, while the licensing of the dealers is done by the Archaeological Survey of India, through its own officers appointed at eleven important cities.

(v) National Register of Antiquities––Data Bank

Consequent upon the implementation of the Antiquities and Art Treasure Act, all the owners of antiquarian wealth are required to register their antiquities with the Registering Officers of the area, who issues certificates of registered antiquities to the respective owners. A copy of the registration certificate along with a copy of the photograph of each object registered is forwarded by the concerned Registering Officer to the Director General, Archaeological Survey of India, New Delhi.

In order to build up a complete record of the registered antiquities a National Register of Antiquities has to be maintained in the Directorate arranging the information so collected statewise as well as districtwise in a systematic manner. In addition to this the registered antiquities have to be classified and indexed. A detailed classified list of such antiquities is to be maintained in the Directorate Office. The entire work when completed will serve as a Data Bank of all the registered antiquities in the country.

(vi) Institutions Exempted from Registration of Antiquities

Some institutions like Museums and Art Galleries, etc. are exempted from registration of their collections with the respective Registering Officers, but a detailed inventory of the collection with them has to be submitted to the Director General, with a copy of photograph of each one of them. Separate albums for such objects have to be obtained by the Directorate of the Archaeological Survey of India.

Besides this the following Acts of the Indian Union also deal with antiquities in one way or the other:

(i) *Estate Duty Act, 1953*
Section 33(I) & (J)
(ii) *Wealth Tax Act, 1957*
Section 5(I)
(iii) *Gift Tax Act, 1958*
Section 5(I)
(iv) *Arms Act, 1959*
Section 11
(v) *Income Tax Act, 1961*
Section 80(a)2(b) & amended Section 47.
(vi) *Customs Act, 1962*
Section 11 (Item-1)
(vii) *Wild Life (Protections) Act, 1972*
The relevant extracts of these enactments are available in Appendix-II.

(vii) Protection of Environments

In the year 1932, the Ancient Monuments Preservation Act was amended to enable the authorities--(i) to exercise greater control over the mining operations in the vicinity of a protected monument, (ii) to acquire protected areas around the monuments, and (iii) to regulate conservation in the country. Even at this stage the responsibility for the execution of conservation works to the monuments was mainly that of the Local Governments. The Act of 1935 made 'Archaeology' a Central subject and though the work of exploration, excavations, chemical preservations, structural conservation, epigraphy, etc. came under the charge of the Archaeological Survey of India, the conservation works continued to be executed by the Local Governments. It was, however, under a Government directive in 1945, that the responsibility for the conservation of ancient monuments was taken over from the State Governments by the Archaeological Survey of India and the relative expenditure was also to be borne entirely by the Archaeological Survey of India.

(viii) Environmental Development

Like the maintenance of monuments Sir R.E. Mortimer Wheeler planned to maintain directly the gardens attached to the monuments at Delhi and Agra. Though the actual transfer of charge of the gardens at Delhi took place in 1950, and those at Agra a few years later, the Garden Branch was established in 1957 by the Archaeological Survey of India, With the passage of time horticulture works aimed at improving the environments of all important monuments scattered over the entire length and breadth of the country, became the responsibility of the Archaeological Survey of India.

(ix) Monuments of National Importance

The Constitution of India made far-reaching changes in the position of archaeology in the country defining clearly the responsibility of the Centre and States vide item 67 of the Central List, item 12 of the State List and item 40 of the Concurrent List of Seventh Schedule. Thus the preservation/conservation of ancient monuments became the responsibility of both the Central as well as State Governments. In the year 1951, the centrally protected monuments and in 1956, the monuments taken over from part 'C' and Part 'B' States by the Central Government, were declared as Monuments of National Importance by means of the Ancient and Historical Monuments and Archaeological Sites and Remains (Declaration of National Importance) Act and Section 126 of the States Reorganisation Act, 1956, respectively. Thus conservation of the monuments of National Importance became the responsibility of the Government of India, while the monuments of local or lesser importance were to be looked by the respective State Governments.

Later a comprehensive legislation—The Ancient Monuments and Archaeological Sites and Remains Act, 1958 was enacted followed by the Rules in 1959 to bring the Ancient Monuments Preservation Act, 1904, in tune with the provisions of the Indian Constitution. Accordingly, the preservation of the ancient monuments of National importance and development of their environments, became the responsibility of the Central Government to be discharged by the Archaeological Survey of India. As per the existing policy of the Government, the original personality of the monuments under its charge has to be maintained while preserving them.

(x) Prohibition of Public Functions at Monuments

In addition to the above, no meetings, conference, parties, etc. except recognised religious ones are allowed in the monuments, nor advertising, selling or convassing works are permitted. If the Government feels that mining operations or construction of the buildings near a protected monument should be prohibited, protected or regulated in prohibited areas, no mining or construction works are allowed, while in prohibited or protected areas they may be allowed under a licence to be issued by the local authorities. The Government of India has now the powers to have unauthorised buildings close to the ancient monuments removed or to acquire the surrounding lands, but the affected persons have to be duly compensated. There is also a penal provision against violation of the above laws.

(xi) Vandalism or Theft of Antiquities

In spite of all the care taken at various levels, cases of vandalism or theft of antiquarian remains may occur at the protected monuments or at museums. The procedure laid down for processing of such cases is described hereunder:

(i) Theft or vandalism at Centrally Protected Monuments

(a) As soon as a case of theft or vandalism at any protected monument comes to the notice of the concerned staff on duty, he will immediately report the matter to the Sr. Conservation Assistant/Conservation Asstt./Caretaker or the Foreman in charge of the site available at the station of theft. The concerned Sr. Conservation Assistant/Conservation Asstt./Caretaker/Foreman will report the matter telegraphically to the Director General, Archaeological Survey of India, Janpath, New Delhi and the Circle Office concerned, and also lodge a report with the police forthwith and forward a copy of the F.I.R. to the Circle Office as well as the Director General, Archaeological Survey of India.

(b) In case the Sr. Conservation Assistant/Conservation Asstt./Caretaker/Foreman, incharge of the site is located away from the place of incident, the staff on duty will report the matter telegraphically to the concerned Sr. Cons. Asstt./Cons. Asstt. incharge of the site, (ii) The Circle Officer concerned and (iii) the Director General, Archaeological Survey of India, Janpath, New Delhi and also lodge a report with the local police.

(c) The Circle Officer on receipt of the information about the theft or vandalism at any monument will visit the site himself or depute any other responsible officer to do so. A detailed report of the theft/vandalism may thereafter be sent to the Director General with adequate number of copies of photographs of the stolen or damaged objects; besides the Director General, information of the theft/vandalism at the protected monuments, has also to be sent simultaneously to other authorities specified by the Director General from time to time, alongwith photographs of the concerned antiquities in the prescribed proforma.

(ii) Theft of Sculpture/Antiquities from Site Museums

The procedure laid down with regard to the theft of sculpture will be the same as described in para (i) above except that of the Officers Incharge of the Museums, will also have to inform the Superintending Archaeologist for Museums as well as the Dy. Suptdg. Archaeologist for Museums about the theft of sculptures/antiquities, etc.

(iii) Theft of Sculpture/Antiquities with Private Owners.

In case of theft of antiquities in possession with private owners, an F.I.R. will have to be lodged with the local police intimating simultaneously to the concerned Registering Officer, who in turn will inform (i) the Director (Antiquity) of the Archaeological Survey of India, Janpath, New Delhi, (ii) his coordinator in the State besides flashing the information to the Customs Authorities in order to have a look out, a check at sea and air ports.

The Central Bureau of Investigation maintains a data bank of crimes of theft of smuggling of the antiquities from various archaeological sites, the criminals and the cultural property involved in such cases. Whenever any crime of some important art object occurs, immediate intimation has to be sent to this Bureau which will provide the required assistance and take immediate steps for detailed investigations and the recovery of the objects.

Utmost care has to be taken to lodge the First Information Report as promptly as possible, and while doing so, it has to be kept in mind that the organised thefts of cultural property are fast operations and even a small respite in lodging a report shall be enough in destruction of valuable evidence or records. Detailed particulars and description of the stolen objects has to be given in the F.I.R. The F.I.R. has also to specify whether the object stolen is in anyway damaged or mutilated and if so, full details thereof have to be specified. Any other information which may be of use in the identification of the sculpture/antiquity, has to be recorded at the time of recording of the F.I.R.

Assistance from Interpol Agency is of considerable importance in cases where the cultural property has been smuggled or is likely to be smuggled out of the country. Assistance of Interpol could be had through the C.B.I. Detailed instructions concerning the reference of cases of theft of antiquities to Interpol and proformas to be used for the reporting of such cases have been prescribed.

(xii) Checks Against Smuggling of Antiquities at Sea and Airports, etc.

To prevent the smuggling of antiquities from the country, adequate arrangements at Sea Ports, International Airports as well as all other check posts on the borders of our country exist. According to Section 50 of the Customs Act, 1962, every exporter is required to declare the objects he intends to export, on the prescribed form. This declaration form is initially examined by the Customs Staff at the Counter, along with other connected travel documents, including contracts, invoices, bill of export, and the O.R.I. forms filed under Exchange Regulations Act. The goods are thereafter subjected to physical examination before being finally exported out of the country. The requirement of Export permit issued by the competent authority is verified by the concerned Customs authority.

If at any stage a Customs Officer has a suspecion about an article being an antiquity and finds it being exported out of the country, without a valid certificate of export, issued by the competent authority of the Government of India, i.e. Director General, Archaeological Survey of India, he has to immediately contact the local Archaeological Officer, for inspection. Light or small objects could be carried to such authority for inspection of such object on the spot and issue of the necessary certificate in due course. (For this purpose the Archaeological Survey of India has posted Archaeological Officers at the Airports as well as Sea Ports at Delhi, Bombay Calcutta, Cochin and Madras.) In some cases, where after the above object has been examined, he shall refer the same to the Director General for his final opinion, which is treated as final.

If the duly authorised Officer of the Archaeological Survey of India is of the opinion that the objects under inspection is an antiquity and cannot be exported out of the country, the same will be confiscated under provisions of Section 113 of the Customs Act, 1972, and punishment for the attempt for illegal export can be awarded under Section 114 read with Section 135 of Customs Act. For an item, which ostensibly may look to be an antiquity, but actually is not so, a certificate of its being a "Non-Antiquity" is to be obtained from the Archaeological Survey of India. For the purpose of having an object declared as an "Antiquity or Non-Antiquity" as the case may be, the Expert Advisory Committee set up by the Government have to examine it. Such Committees meet periodically at Delhi, Calcutta, Bombay, Madras, Srinagar, Bangalore, Varanasi and Trivandrum. The objects declared to be 'Non-Antiquity' by the Committee can be exported out of the country.

(xiii) UNESCO Convention on the Means of Prohibiting and Preserving Illicit Import, Export and Transfer of Ownership of Cultural Property

During the past few decades the theft and smuggling of antiquities from one country to the other reached alarming proportions and started attracting attention of the world community and international organisations, viz. UNO and UNESCO. In order, however, to arrest the tendency of theft, vandalism and smuggling of cultural property from one country to the other, legal measures were considered ultimately in 1970. UNESCO passed a Convention for prohibiting and preventing illicit import, export and transfer of ownership of Cultural Property. Among other things it defined cultural property in much broader terms than the Antiquities and Art Treasures Act, 1972, passed by the Government of India.

The Convention thus recognised the importance of international cooperation in prohibiting the illicit export or import of 'Cultural Property' as defined by the Convention. It also envisaged the creation of adequate machinery at the national level as also the legislative measures to prevent the illicit trade of cultural property for giving effect to the basic idea of the Convention. It also enjoins upon the States/parties to adopt measures to prevent entry of any category of Cultural Property from a foreign country without a certificate of authorization of export from the country of origin and also for the museums of the countries to adopt a firm principle and practice of refusing to accept any object which is not accompanied by an authorization certificate or without verification of its antecedents as basic ethic of acquisition.

In the UNESCO Convention, there is also a provision for the restoration of objects of Cultural Property which are initially smuggled out of a country are subsequently detected to have been illegally imported into another country. In such cases, the country of origin can claim back their objects under the Convention provided the right to such object or ownership thereof is established with the help of documented evidence. In case the ownership of the country of origin is established, it shall have to pay adequate compensation to the innocent buyer of such objects in the foreign country besides meeting the charges for the transportation of such objects including other incidental charges. The entire processing shall be done through diplomatic channels.

The UNESCO document on the means of prohibiting and preventing the illicit import export or transfer of ownership of Cultural Property, was ratified by India in November, 1974.

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23. It is also possible that the three arms refer to the elephant force, cavalry and infantry.

7

Chemical Conservation

(1) Introductory

Many of the monuments in the country have paintings, sculptures, decoratives, floral designs, carvings, etc. which need chemical cleaning and preservation are being attended to by the Chemistry Branch of the Archaeological Survey of India and other science laboratories in the country. Before taking up these chemical conservation works, study and investigation of building material and ancient techniques including preparations and pigments, study of their reflectance value and micro analysis, examination of glass, potteries, ceramic materials, terracotta, fabrication, techniques, analysis of metals, then metallurgy and metallography, mortars and plasters, etc. are necessary.

Soil and surface analysis, Geochronological studies including geological investigations in relation to Archaeology, study and investigation of injurious effects of atmospheric pollutants on archaeological monuments also form part of this study/research. These programmes are essential to restore the originality and the posture of the material used in an ancient structure without causing any damage to the structure and in order to prevent further decay or deterioration of the same.

Subsequent to the decision on setting up of the oil refinery at Mathura, the Archaeological Survey of India has been making studies, investigations on atmospheric pollution from the refinery as well as 263 foundries and taken all possible measures for observing the effects on the Taj and other monuments in and around Agra. The Indian Oil Corporation had sought assistance from reputed and experienced organisations from inside the country as well as from abroad for the purpose. Accordingly a team of the representatives of Techneco, Rome was invited to study and estimate the likely concentration of pollutants from the refinery. Subsequently, the study of atmospheric pollutants and their degrading effect on the Taj and other monuments in and around Agra was instituted by the Italian Company M/s. Techneco. A team of technical personnel of the Archaeological Survey of India was deputed to work with the Italian experts in December, 1975. It was decided by the Government to establish an air pollution laboratory under the Archaeological Survey of India at Agra to study the following:

(a) Determination of various meteorological conditions at different distances from Mathura Refinery.
(b) Determination of permissible concentration of pollutants with reference to preservation of monuments. Up till now, no suitable standard has been devised to ascertain the permissible limits of the harmful pollutants, e.g.
    (i) Oxides of sulphur.
    (ii) Oxides of nitrogen.
    (iii) Oxides of carbon.
    (iv) Hydrogen sulfide and others.
(c) Evaluation of expected pollution.
(d) To measure the relative humidity, temperature, wind speed direction and particulate matter.

The Archaeological Survey of India, therefore, established an Anti-air-Pollution Laboratory at Agra. Since a straightforward method of conducting laboratory tests and indicating or arriving at the rate of corrosion of the monument does not exist, detailed studies and investigations on weathering condition, humidity, quality of stone used, pollutants in the atmosphere, etc. have to be carried out manually. The Air Pollution Laboratory at Agra is not only concentrating on the study of gaseous effluents from the Mathura Refinery but is also dealing with the scientific study of the deterioration of large number of monuments on accounts of industrial exhausts from factories, effluents from Railway Yards and automobile exhausts due to heavy vehicular traffic, etc. The effects of these atmospheric gases on monuments in Ahmedabad, Belur, Baroda Region, Mahabalipuram and on paintings and sculptures in southern part of the country and Delhi monuments is also being studied. The effects of the gaseous effluents on some of the monuments of the south has also been reported and a large number of samples is already under analysis and laboratory examinations at the Science Laboratory, Dehra Dun.

In the context of industrialization, the full effects of pollution and means to mitigate the damage arising therefrom need to be kept under constant observations since the decay and the deterioration caused to the archaeological heritage and relics from such gaseous effects have to be checked and tackled. The investigations and the studies connected with the subject matter are so extensive and many sided that highly technical and experienced personnel with adequate academic qualifications as are essentially required have to be engaged for this important task.

The status in respect of preservation of the artefacts or the works of art will depend upon the composition and the environment in which these has been kept for hundreds of years. In case of a monument the two most important factors would involve both intrinsic and extrinsic factors to have a complete spectrum of the deterioration taking place. This includes humidity, temperature, wind velocity, direction, particulates, the nature of the materials, its reaction towards its surroundings, temperature and the soil, etc. In the case of excavated material the course of deterioration is affected by the depth, the nature of the soil, the acidity of the soil, the presence of salts and its own chemical composition. A stable environment will always lead to a stablised object; therefore, before an object is taken for treatment it is necessary to know the environment in which it has been found. It is generally believed that a RH between 50 to 60% with temperature of nearly 15 to 20°C is a good situation on which an art object will have the maximum safeguards. The treatment of the organic material consists in general the examination, and the measurement of its physical properties, the type of deterioration that has taken place and then retrieve the lost material strength by suitable means.

(2) Chemical Treatment of Materials and Monuments

(A) Organic Material

The organic ones containing carbon and includes *bones, ivory, manuscripts, books, leather, parchment, vellum, textiles, etc*. The treatment part first consists of the identification of the materials and the deterioration that has occurred with time as a result of the impact of the surrounding atmosphere with climatic condition as well. The treatment in general consists of the fumigation, deasidification treatment with aqueous solvents or with organic solvents to get rid of the unwanted deposits which have happened with passage of time or accumulation of dust and dirt. Strengthing of the fragile textiles and lamination of the weak manuscripts by dry or wet process are some of the well known techniques in use in the laboratories in India. Individual treatment is given in case of other items.

(i) *Paper*: Paper had been an important raw material for writing since time immemorial. The quality of paper depends upon the raw material from which it has been made and the various processes which have been employed for its manufacture. The paper suffers on account of yellowing, development of acidity, loss of tensile strength, folding endurance and the growth of mildew and foxing. The methods suggested with having the micro biological growth are as follows:

(a) Keeping them in an open air or in the large room and brushing and sunning.
(b) Fumigation of the room; many chemicals both in liquid, solid and gaseous forms have been recommended.
(c) Fumigation with thymol, napthalene, para-di-chlorobenzene, formaldehyde vapour and ethylene oxide (Etoxide), as well as sulfural flouride have been recommended.
(d) For the de-acidification the following methods have been recommended:
    (1) Ammonia gas acidification.
    (2) Immersing the paper in saturated solution of lime water and treatment with calcium bi-carbonate.
    (3) Non-aqueous-de-acidification.

Barrow suggested two stages:

(1) removal of acidity.
(2) lamination in which the papers are placed between two sheets of cellulose acetate foil and sheets of fine tissue paper and then hot pressed between 50-55°C. The tissue paper disappears and the cellulose acetate is fixed on the surface. For very important document inert atmosphere has been recommended as in the case of chapters from American Constitution where Helium has been used.

For prints, drawings and manuscripts both dry and wet methods are recommended depending upon the condition of the manuscripts; for improving the colours of a manuscript or paper, use of hypochlorite has been recommended. This works by the action of nascent chlorine; another method is the use of chloramine-T and also H_2O_2 has been recommended.

For cleaning the material specific solvents are available which can be made use of.

In the case of parchment and vellum, special care is to be taken for mounting and relieving them from creases.

For leather objects one has to keep them away from moisture and to fumigate them off and on to safeguard against fungus and insect attack and it is of utmost importance that leather is inspected regularly and cleaned from time to time and for that purpose many formulae have been recommended like:

(1) Pyrethrum/DDT spray.
(2) Leather dressing.

(ii) *Textiles*: Textiles form an important part in a collection in which one has to identify the nature of the textile whether it be a natural one like silk, wool, cotton, etc. or a synthetic one like terylene, viscose or nylon 66 or polyester fibers; their deterioration has been classified as under:

(1) Physical.
(2) Chemical.
(3) Biological.

In the first case the physical strength is affected by exposure to light and temperature, the chemical deterioration is brought about by the gases present in the atmosphere, biological deterioration is due to humid condition and results in the growth of micro organism, fungus, mould, etc.

The treatment will depend upon the condition of the material and whether its strength will be able to withstand the wet or dry cleaning in usual way and under vacuum. The textiles as a whole are organic in nature and date back to prehistoric days, e.g. as would be evident from the following examples:

(1) Textile from Itzehoe (wool from the bronze age).
(2) Bog burial from Hunteburg-Iron age.
(3) Merovingian grave-bronze-vessel-containing textiles. (Chinese claimed to have used textile 5000 years back.)

The deterioration in a textile is generally brought about by (1) natural aging under the influence of light and atmosphere. (2) Mechanical wear and tear. (3) Biological attack.

(1) The rate of deterioration will vary with the intensity of light, temperature/humidity and the time of exposure for this purpose. Protective measures have been recommended like the use of artificial

illumination, etc.

(2) To filter out the ultra-violet light by the use of varnishes and UV-absorbers.

For keeping a textile in a good condition the dry atmosphere with good ventilation is recommended and damp heat should be avoided as far as possible. The treatment part consists in general of the following:

(1) Real dry cleaning.
(2) Washing with suitable solvents with surface active detergents like alkaline-soaps, lux soap having pH between 9 to 10.
(3) Washing with non-ionic soap like lissapol and igepal.
(4) Acidic soap use of saponins having mild detergent power.
(5) Dry cleaning with use of anhydrous organic solvents.

If there are problems of stains, hydrogen peroxide, sodium perborate, etc. has been recommended, depending upon the nature of the stains.
Insecticides and fungicides recommended are Para-di-chlorobenzene, (2) Thymol, (3) Nepthalene, (4) Camphor, (5) Dieldrin, (6) Freon. More recently the use of antibiotics like pimafucin has also been recommended but the best course would be to isolate the textile and keep it in polythene bag with suitable fumigants. For consolidating a fragile textile, several consolidants have been recommended like polyvinyl butyral, PV-acetate (Setamul), Rhovinal-B10.

(3) Polyvinyl with Support of Taggod Polyester Fibre:

For according support many fibres like Kashmiri silk, mat, chiffon, taggol or polyester fibres are recommended.
Storage under proper condition and under proper ventilation is one of the safest method for its preservation. Standard condition should be 70°C and 50% ± 5% RH. The storage should be cool and dry.

(iii) *Wood*: Construction of the buildings, monuments and objects generally depend upon the availability of the local raw materials. In our country wood is available in large quantities, as in Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Assam, etc. In these areas it has been observed that use of wood has been made in the construction of buildings, temples, art objects, etc. very frequently. Sometime wood has been brought for this purpose from neighbouring countries such as Burma, Nepal etc. Wood can be considered quite durable for years together provided it can be saved by its decaying agents such as soluble salts, insects and fungicide.

Deterioration of Wood and Its Causes

Deterioration in wood brings change in colour, and in advanced stage its shape is altered.

Wood generally decays due to presence of salts, insects and spread of infection, etc. If wood dust is coming out through borings and tunnels, in that case presence of insects and their larvae is certain.

Presence of salts can be confirmed when the surface of wood becomes powdery and there is a sign of incrustation and crystalline deposits. Sometime wood becomes spongy, even a little pressure of the fingers results in depression on the surface.

There are other defects like net work of cracks running parallel to and across the grains, then the wood has a tendency to shrink and warp. It is known as dryrot brought by certain fungi. Water logged wood creates problem for preservation whereas presence of bacterial infection in wood has no destructive effect on the wood.

Preservation of Wood

Consists in the following steps:

(1) Eradication of the causes of decay in the wood.
(2) Sterilisation of the material.
(3) Consolidation of the texture.

Measures to be Taken

(1) To kill the insect beetles and larvae, fumigation of the wood is essential with the help of carbondi-sulphide alone or with a mixture of carbonetetra-chloride and ethylenedi-chloride and finally with sulphuryl flouride in concentration of 1 to 2 parts under strict condition of control.
(2) Soluble salts such as sodium, calcium, magnesium chlorides and sulphates are removed with the help of paper pulp treatment till it is free from salts or with the use of solvents.

In case of painted, wooden panels with water soluble ink as writing material, it should be fixed with 1% methyl-metha-acrylate solution in toluene. After removal of the salts wood becomes porous and therefore it should be dipped in 5% solution of P.V.A. or 5% methyl-metha-crylate, consolidation with wax resin mixture under I.R. is also recommended.

Wood affected by dryrot should be heated at about 130°F to kill the effect of fungi, sodium flouride, magnesium-silico-fluouride, zinc chloride, etc. are used as wood preservatives in aqueous solution, but in case of dryrot affected wood alcoholic solution should be used.

Porous surface can be hardened with the help of 5% polyvinyl acetate solution in a mixture of alcohol and toluene. Water logged wood should be allowed to dry very slowly in the shade, better, it should be covered with saw dust or husk then it should be treated with alcohol to replace the absorbed water.

Filling of cavities with the help of 5% P.V.A. solution or emulsion in alcohol and toluene can also be resorted to.

Mixture of glycerine and alum is also used. But P.V.A. method is better. Filling of cavities with the help of 5% P.V.A. solution in alcohol or toluene can be done.

Alum Method

Potassium-aluminium-sulphate, $K_2SO_4(SO_4)_3$ 24 H_20 is a salt which has much greater solubility in hot water than in cold water; it will in fact dissolve its own water of crystallization at 96°C.

Arigat-C-Method

This method depends upon the use of a special malamine formaldehlyde resin used to impregnate water logged wood.

Polyethylene Glycol Wax Method

Polyethylene glycol are synthetic materials which have the general formula, $HOCH_2$-$(CH_2OCH_2)_nCH_2OH$ and is very useful for water logged wood.

(iv) *Ivory*: Generally ivory objects are found in a fragile condition on account of salt action due to burial in the ground. They are occasionally stained with iron compounds.

Object should be consolidated by impregnation with vinyl acetate or bed-acryl solution to avoid flaking, spalling or disintegration. It should be carefully wrapped by cotton thread all round and later on suspended in water till it is free from soluble salts and other accretions. It should be carefully dried at room temperature. Avoid rapid drying which will be harmful to the objects. Preserve it with vinyl acetate, methyl-metha-acrylate or bed acryl solutions. Dull and stained ivory can be rendered white by bleaching action of 10%

hydrogen peroxide.

(v) *Bone* : Same treatment as ivory.

(vi) *Horn* : Clayey and Calcareous incrustations can be removed by washing and brushing. Tenacious incrustations of calcareous material can be treated with 2 to 3% solution of hydrochloric acid.

(vii) *Leather* : Objects made of leather have a tendency to become hard and brittle with age. Moisture and high temperature are quite harmful to leather objects.

Application of castor oil periodically takes care of leather objects. Lanolin (woolfat) and Vaseline can also be employed.

If leather is salt affected it should be washed in running water till it is free from salt, after that it has to be dried up at room temperature and should be treated with castor oil or lanolin.

Leather affected by insect, mold and bacteria can be fumigated with carbon di-sulphide and thymol. After fumigation leather object is treated with alcoholic thymol.

To check the fungal growth on leather mixture of equal quantities of para/nitro/phenol and penta-chlorophenol in aqueous or alcoholic solution may be used. Pentachlorphenol and its derivatives, such as santophene or santobrite, have been found quite effective.

Eradication of insect-pest by spraying solutions of insecticides with sprayer or spray gun can also be tried. A mixture of D.D.T. and Pyrethrum (60 gm of each) in 1/2 litre of colourless paraffin distillate is an effective agent for exterminating moth/silver-fish/termites, and similar insects. If fur, these are periodically subjected to the action of boric acid dust, in order to remove the chances of appearance of insects––use of para-di-chloro-benezene, etc. will eliminate the danger of insects and vermins.

(B) Inorganic Material

Inorganic chemistry is mainly divided into two parts depending upon the nature, the chemical characteristics of the material as well as their chemical reactivity towards other materials in general.

(a) *Metals:* By metallic nature, it is interpreted that the material is having a metallic core (i.e. electropositive-charge) malleability, ductibility, hardness / strength/good conductor of electricity, in this group platinum, gold, silver and copper, iron, lead, zinc and alkali-metals, etc. are included.

(i) *Gold*: It is well known that gold is a very ancient metal and one of the earliest to attract the attention of primitive man. Gold and platinum have been also known from very early times in the form of electrum. Gold occurs as free and virgin in nature and is found in the rocks and gravels of many rivers.

Flint daggers with gilded handles have been reported from excavation in Egypt. Gold is also mentioned in the earliest writing of civilized man; representations of quartz crushing and gold refining process are reported to have been found in Egyptian tombs dated to 2500 BC. The gold mines of Nubia were worked extensively by the early Egyptians.

Pliny had described the amalgamation process for extraction of gold. Cupellation process was used in the second century and the same process is referred to by Jeremiah in the Old Testament in 600 BC.

Occurrence

(1) Gold has been found in metallic condition in quartz veins as reef gold.
(2) Alluvial gold found by weathering of auriferous rocks.
(3) Nuggets, one found in California USA weighed approx. 190 pounds.

It is rarely found pure. Sea water contains 3 and half grains per ton. Granite also contains, 37 parts per million.

Extraction

(1) *By panning;*
(2) *Dredging*;
(3) *Cupellation*;

Properties

It is a yellow metal with brilliant lustre. It is soft, most malleable and ductile of all metals. Density is 19.3. It is a noble metal being unattacked by air, acid or alkalies but dissolves in aqua-regia.

Treatment

(1) If the metal has some superficial incrustations like lime, clay, etc. the use of dilute nitric acid in the range 1.0% to 1.5% has been recommended.
(2) Siliceous muddy or incrustations can be eliminated by using surface active detergent with some solvents.
(3) Organic stains can be removed by suitable solvent by identifying the nature of encrustation.
(4) Gilded materials should be taken care of and these should not be

reduced by electro-chemical means or any such process.

(5) For treatment it is necessary that if gold is alloyed with some other metals, its nature should also be taken into consideration before reducing or adopting any such process.

For the purpose of preservation, 5% to 1% of PVA or incralac is to be used.

(ii) *Silver*

It is known from ancient times since 4000 BC, to predynastic Egyptians who were in the know of its properties but it was very rare. A fine Chaldean silver base of 2850 BC is in the Louvre Museum in Paris.

It is believed that the oldest silver came from Northern Syria and Asia minor. Silver is found in the following minerals:

1. *Argentite*—is a sulphide of silver, a very common material.
2. *Horn Silver*—this is equivalent to chloride of silver.
3. Pyrargyrite—silver-antimony sulphide.
4. *Prousite*—this is a less important one and contains silver arsenic sulphide.
5. *Galena*—it is sulphide of lead.

Extraction

(1) Cupellation process is mentioned by Pliny and Strabo.

- (A) Parks process.
- (B) Pattinsons process.
- (C) Amalgamation process.

Properties

It is a soft white lustrous metal, fuses at 960°C. It is found in metallic condition in nature. Sulphide is black, chloride is grey and is used mostly for coinage and ornament.

Deterioration

In an atmosphere where pollutant gases like sulphurdioxide, hydrogen sulphide, etc. are present. It has been observed that silver objects develop slight blackening effect due to tarnishing and the formation of a thin film consisting of silver sulphide and when combined with other metals which are not noble, green incrustation has also been found in many of the silver alloyed objects. Many precautions have been recommended and one of the important one is to periodically clean the object, keep it in a pollution free atmosphere and the recommendation is that anything containing sulphur should be avoided by way of contact as sulphur present in the paints, in the rubber flooring which may produce the tarnishing effect and during exibition it should be ensured that the textile over which the object is exhibited is free from sulphur.

Treatment

(1) The superficial tarnishing can be eliminated by a slow treatment with a putty consisting of plate powder, chalk, soft cloth which methylated spirit containing ammonical water.

(2) The materials having tarnishing effect can be reduced to their original form by electro-chemical-method in which the silver is placed in contact with aluminium or zinc and then covered with a solution of sodium hydroxide (5%). The reduction is allowed till the stains disappear. A thorough wash is necessary and then polishing with soft muslin cloth is recommended.

(3) In order to avoid deterioration it is better to keep it in polythene bag with airtight seal or with stained silica-gel.

(4) The present trend is to keep the silver in antitarnish paper which is green and coated with copper compound containing chlorophyll, etc.

(5) During exhibition it should be ensured that no sulphur is present in the material over which the object is placed. It is a question of policy whether a patina of sulphide is to be removed or not and depends upon different institutions and their policies.

Silver chloride is another deterioration which is generally found in the silver-object and the treatment can be decided only after examining the strength of deterioration and the impurities which are present, etc.

(1) Strengthing of the silver is done by heating to a dull red heat for a longer time, care has to be exercised if copper-chloride melting at 422°C is present while the silver chloride melts at 422°C.

(2) If the silver is based with copper oxide, dilute sulphuric acid can be used, different chemicals have been recommended if copper incrustation over silver is present, these are ammonia, potassium cyanide, formic acid, citric acid, etc.

If conglomerate of coins have been found in a lump, they can be detached by the use of 1 to 4% citric acid or by reducing it by electro-chemical reduction.

Preservation

Polyvinyl acetate and methyl-metha-acrylate (.5% in toluene).

Consolidant

Bedacryl, Durofix.

(iii) *Copper and its Alloys*

It appears to be known from prehistoric times, from the chalcolithic age. Long before the histories of ancient peoples were engraved on stone-pillars objects of bronze were in existence dating back to 3000 BC. It is the Romans who found it first and that is why it is called cyprium.

Occurrence

Copper in virgin state is found in many localities of Australia and Chile in many forms. In India it is available in Singhbhum (Bihar) and Khetri and a few other places.

Oxidized Uses

1. *Cuprite*—Red Oxide-Cu(ous)Oxide it has 88% of Copper.
2. *Melaconite*—Black-oxide of Cu(i) form.
3. *Malachite*—Green carbonate of Copper.
4. *Azurite*—Blue carbonate of copper.
5. *Chrysocolla*—Silicate of copper.

Extraction Process

1. Roasting of ore.
2. Smelting.
3. Bessimer Converter.

Properties

Copper is malleable and ductile, pink in colour, good conductor of electricity/head-copper when alloyed with lead and zinc—the surface gives a rather unpleasant appearance.

Deterioration

Deterioration occurs when these objects lie buried under soil; copper soon loses its metallic appearance with the formation of cuprous oxide (Red) which in turn may become encrusted with basic carbonate that is green or blue in colour—malachite and Azurite. For bronzes the formation of cuprous chloride is most damaging and produces what is known as bronze disease. The spots grow as a result of nantokite (cuprous-chloride) being transferred into atacamite (basic-cupric-chloride) by the action of O_2. The treatment is quite complex and the most important thing is to get rid of the chloride—which is difficult to remove. When the object is taken out of soil, the equilibrium that is there between the corroded bronze and the environment is disturbed and deterioration starts as a result of change. The conservation methods would depend upon the condition of the objects and the presence of the metallic core. The methods would largely be those as following in which :

(1) *Patina or encrustation can be scarified*

- (A) *Electro-chemical reduction zinc, Al and sodium hydroxide.*
- (B) *Electrolytic reduction-object is made the Cathode.*
- (C) *Use of alikaline-rochelle-salt* (this method is used for dissolving the cupric salts), with 10% of H_2SO_4—cupric oxide can be made to dissolve; after this Cu_2O(ous) oxide remains which are brownish red are removed by mechanical brushing and also by electrolysis. Some times H_2O_2 along with Rochelle-salt is made to preserve fine line ornament.

(2) *In which patina is to be preserved*

- (A) *Main idea is to stop corrosion and maintain the object by the use of 5% of sodium*. Sesqui, carbonate.
- (B) *Electro-chemical-method.*
- (C) *If gold is present, it can be treated with HNO_3 and if silver is present, Formic acid can be used.*

Adhesives

The joining of broken pieces can be done by the following adhesives:

1. Bedaeryl.
2. Shellac.
3. Wax etc.

Preservation

Poly-vinyl acetate (0.5 to 1%) or methyl-methacrylate in toluene.

(iv) *Lead:*

(1) Lead objects are treated with zinc and caustic soda or with dilute solution of acetic acid to reduction. When corrosion has been eliminated, it should be washed with boiled water free from carbon-dioxide, object should not be brought in contact with paper and similar organic materials. It should be stored in glass or metallic cases after preservation with vinyl acetate or methyl-metha-crylate.

(2) When fine details are there, in that case hydrochloric acid-cum-ammonium acetate method has been found to be quite effective.

(3) *Ion-Exchange method:* Corrosion products of lead, i.e. lead, carbonate and chloride could be eliminated from the metals by the use of Ion-exchange resin. The object is placed in a case with granules of amberlite or Ion-exchange resin in hot distilled water. Corrosion products are gradually dissolved but metallic lead remains uneffected.

(v) *Iron*

The earliest reference to Fe was 1400 BC, occurring in Assyria.

Pliny says that in 218 BC, Fe rings were in general use.

In India the Fe was used sometime around 2006 B.C. An iron pillar is well known; it is 23′8″ high and 22 ft above ground, with following contents:

1.	Wrought Iron	-	99.72%
2.	Sulphur	-	.0006%
3.	Phosphorous	-	.114%
4.	Manganese	-	Absent
5.	Carbon	-	.08%

1. Egyptian in Gazeh used it 5000 years ago.
2. Chinese used steel around 2500 BC.
3. In India vedic period has mentioned about this.

Occurrence

Iron occurs in the metallic condition in meteriorites, where it is associated with Ni, Co, Cu, etc. and the old examples have been identified by their trace elements.

Terrestrial

Iron is of rare occurrence because it is so readily oxidized, and converted to minerals.

(1) *Magnetite* Fe_3O_4
(2) *Haematite* Fe_2O_3
(3) *Carbonate*
(4) *Fe.pyrite*—(1) cast iron (2) wrought (3) steel.

Extraction

Cast iron is least pure.

Blast Furnace

The materials coming out of this furnace consists of--

Fe - 92 - 95%
C - 2.5 - 4.5%
Si - 0.7 - 3%
P - 0.5 - 1%
S - 0.1 - 0.3%
Mn - 0.2 - 1%

Properties

Iron is a very lustrous metal with MP at 1527°C and boils at 3000°C with density of - 7.87.

Deterioration

Iron is black gold and the most utilized of any metal. Iron is not affected by pure, air-free water, but it gets quickly rusted by H_2O containing O_2. The rust consists of ferric hydroxide and ferrous hydroxide, but on further oxidation that rust becomes substantially a hydrated ferricoxide in which some CO_3 is usually present.

The salts act as electrolyte and the mineralization is completed actually, some act as anodic and the other as cathodic and the salt acts as electroyte and the metal behaves as a galvanic cell. Thus has been noted that iron corrodes in the + Cl of NaCl. At the anode form of ferrous chloride, and at cathode-NAOH a film is formed which is brocken up by O_2 and their corrosion proceeds, but it does not necessarily mean that if O_2 is not present, corrosion will not proceed. The film may be broken up by bacterial action as reported.

Actually under unstable condition, iron rusts more.

Treatment

It is necessary to examine the objects before any treatment is recommended. Presence of Cl must be seen first. If Cl is not present it is generally seen that the rust has stabilized. In case the chemical activity is to be seen for further examination, X-Ray is necessary because iron-oxide is transparent to the rays.

Electrolytic Reduction

(1) REDUCTION

When the core of the metal is present, the reduction method is employed. When the core is discontinuous—no reduction method is employed.

$$Zn + 2NaOH \text{———} Na_2ZnO_3 + H$$

(2) NaOH

This method is used where there is the NaOH inhibitor and when the object is very fragile, no reduction should be attempted, it is treated by boiling in NaOH several times.

(3) HEAT TREATMENT

Use of blow lamp for separating a mass of corroded objects is full of danger.

(4) The methods of rust-softening, solvents and inhibitors used are detailed below:--

(a) Rust spots can be softened by keeping the steel under paraffin oil, unparaffin with a dry cloth and replaced with a lubricating oil. A thin layer of non-sticky wax can also be used.
(b) Certain rust removers are also used as rust softners and also act as inhibitors (after inhibitors are derivative of phosphoric acid). Tannins are also used.
(c) Rust may be removed by 5% oxalic acid.
(d) Use of EDTA (Ethylene-diamine tetra acetic acid).
(e) Versene T—Vejsene Fe-3-for Fe-salts.

Protective Finishes

1.5% glycerine in alcohol on sword blades can act as a good preservative, it can also be treated with 1.5 ml of Conc. HNO_3/100cc of Alcohol. It will remove the grease that is present and then the use of nital-solution is made.

Then this should be kept waxed.

When no iron core remains, the speciman is said to be stable but the presence of salts should be removed and tested, and preserved with nitro-cellulose. It should be seen whether the removal of rust will lead to some disfigurement or disintegration.

For Repairs

Solders should be used (Ph/Tin), for joining fixes, thus:—

(1) Baker's soldering fluid.
(2) Arax.
(3) Solderine.

(B) Clay & Glass

(1) Burnt clay objects can be treated with dipping in water, which will remove all soluble salts.
(2) Lime accretion can be attended to with 5% acetic acid or 1 to 2% hydrochloric acid followed by thorough wash in plain water.
(3) For fragile and highly porous and weak texture, consolidation with P.V.A. solution is necessary. For this purpose the pulp treatment is found more effective than dipping in water.

Unburnt Clay Objects

(1) These objects cannot be treated with water treatment.
(2) Sufficient strength can be imparted to these objects by controlled firing in a furnace. Such objects should be air dried and kept in an electric furnace, by gradually raising the temperature of the furnace to 600°C for five to six hours. Then they should be allowed to cool down. After this the object becomes quite strong to stand water treatment.

(C) *Glass*

Glass objects are generally found to be highly weathered, porous and spongy. Due to decomposition of glass by carbonated ground water, alkalies are leached out and silica, accumulated corrosion products and weathering may often proceed right to the core of the objects. In such cases washing with water should be avoided and the object to be treated should be impregnated with vinyl acetate solution and wrapped with cotton thread to prevent flaking or disintegration during cleaning. The accretion should be removed by using minimum quantity of water and organic reagents such as alcohol, benzene, etc. generally decayed glass is iridescent. Such iridescent glass can be brightened up by treatment with 2 to 3% hydrochloric acid followed by thorough washing. Decaying glass should be stored in a dessicator or museum Jar with silica gel due to hygroscopic tendency.

Glaze, enamel and faience generally contain 60 to 90% silica and varying proportion of alkali, and should be treated in the same way as glass.

(3) Stone in Indian monuments and other Art Objects, Problems in its Conservation

India is provided with a large number of stone monuments, some of which are extremely important from aesthetic point of view while the others are important from historical and decorative point of view. The stones used in these monuments are of a variety of composition. Starting from granites, khondalite, talic marble, sand stone, chlorites, lime stones, basalt, banded gniess, charonokite, quartzite and other types and thus we have a complete array of such cultural heritage before us for the purpose of not only preservation but also to probe into the technique of alternation of study of the resultant product. All these involve a large number of independent studies which we call as multidisciplinary study of the weathering features of the stone monuments.

Though this is a very wide subject which includes the identification of the material, the determination of the chemical properties like finding out the compressive strength, porosity and other concerned physical properties as well as the chemical ingredients present in the stone which have the properties of chemical reaction resulting in the weathering of the stones. The work involves as a whole the combined effort of a group of dedicated workers in various disciplines. The chemist will identify the chemical composition, the micro-biologist will identify the micro-biological agents which are acting on the stones, the petrologist would study the rock through thin sections, the geologist will study the rock with a view to the points of rock formation that has taken place with time, the physicist will use the materials with reference to instrumentation and in brief the whole study becomes a bio-chemico-petrographical phenomena and therefore projects a multidisciplinary as well as interdisciplinary approach.

After a thorough study the secondary and then other important parts come in, i.e. the treatment, the consolidation and the preservation part. This study would involve the review of the magnitude of preservation and restoration problems.

The disintegration of the stone monuments may be due to various factors including the following:

1. Micro-Biological Factors

This is the most dominant form as the monuments are lying open. A distinct line of difference in preservation, which must be made clear in respect of outdoor and indoor materials, is that the indoor stone materials can be protected with ease under controlled climatic condition, but not so when the monuments have micro and macro climatic conditions and are lying open and exposed to all external forces of destruction. These two are entirely different and their methods for preservation also differ. The micro-biological agents are in the form of bryophytes, algal and pterophytes, etc. and are found on the surface of the stone discolouring the beauty of the monuments and also causing biochemical decay or alteration of the mineral grains. Since their nature is to grow they penetrate the pores of the stone fabrics and result in either cracking or weathering of the stone, and act both chemically and mechanically as shown by Miss Fry who explained that "the powerful forces exert by gelatinous tissue when expanding or contracting under the influences of moisture." One thing may be mentioned here that one factor alone is not responsible for the decay of the stone materials as such but it is only a continuation of many factors which are responsible for the quick decay and pulverisation. The stone monuments thus become patchy, ugly in colour with the formation of green or black spots or patches. These stones have long life and with the excessively slow growth they are resistent to any change, whether extremes of temperature or drought. Their bodies are choosy also, some varieties prefer calcareous, others silicious rocks. It has also been suggested at some quarters that these formations are of protective nature. A lot of research has been done by various scientists to determine the effects of nitrifying and sulphur bacteria. The ultimate product is acid which in turn attacks the stone. Kauffman studied the nitrifying bacteria and reported that the nitrifying bacteria convert atmospheric ammonia into nitrite and nitrate salts which produce efflorescence on stone. The work of Hyvert on Cambodian monuments suggest that the bacteria may play an important role in rock weathering. However, Schaffer suggested a limited role in the deterioration. The gypsum which is responsible for the disintegration of Kanheri and Jogesawari Caves but whether it has come from the action of sulphur-bacteria or the aerial oxidation of pyrite or it is the product of both chemical and bacterial action is still a problem to solve.

(i) *Inherent Weakness of the Stone Fabric*

At the time of the formation of the rocks different factors both physical, chemical and mechanical are involved resulting in the formation of a type of material which is not homogenous as well as not having uniform mechanical strength all over. These are due to the weak spots produced in the stones which become known only after the stone is exposed to the atmospheric conditions; one of them is the rocks of sedimentary nature and having beds of different structural composition. The second and much noted one is presence of shakes and vents which are called micro-cracks in the stone material, since the ingredient of the stone material consists of different chemical minerals as well as the composition of the co-efficient of contraction and expansion also vary resulting in the formation of visible bigger cracks which entirely give way under immense pressure and change. Another thing which we have noted particularly in the Khondalite of Konark temple is the veins of calcitic material which has been a bonding source for the stone matrix being dissolved away due to the carbon dioxide present in the atmosphere with the formation of bicarbonates which are soluble and result in the loss of the bonding. These fissures which are a source of weakness are known as vents also.

(ii) *Deterioration on Account of Air, Sand, Pollution and other Relative Factors, like Humidity, Temperature, etc. (Physical Weathering)*

One of the most important agencies is the air pollution which is now assuming enormour proportions causing the decay of many monuments. In India we have seen and marked a lot of action of the atmospheric pollutants like SO_2, Carbon dioxide, oxides of nitrogen, the particulate matter, acidic rains and metallic fumes due to industrial development. The action of the wind has its own devastating effect resulting in the erosion caused to different monuments where the wind velocity and the diurnal temperature change rapidly with wide gap. The air is known to contain a large number of solid particles of silica, resinuous material, metallic particles and allied particles, and when the wind speed is much it strikes the surface of the monuments producing erosion by mechanical action as is happenning in Konark, Mahabalipuram and such areas. The monuments located on sea-shore have their own problems since they are very much affected by saline-winds. Granites are particularly susceptible to mineral disintegration, due to repeated heating and cooling but without abrupt change in temperature. In cold regions the rock weathering is a mechanical fault rather than a chemical one.

The soluble salts in solution get into the pores of the stones while sand grains abrade the surface. In nature the physical weathering of stones take place on account of various factors, e.g. wind, rain, solar radiation and the cumulative effect of all these. During high humidity seasons the soluble salts go into the solution and penetrate the pores of the stones and when the humidity is less and more of evaporation is taking place, the soluble salts come out of the surface and in this process, any impediment in the way is removed thus causing damage to the stone. Coastal winds have their own action on the monuments, it carries angular sand particles which cause abrasion and scouring of the monuments when the sand particles strike against the surface with considerable speed. If the diurnal temperature is much, then the chances of physical disintegrations are much more, metrological factors like rain fall, etc. are also important. There is no evidence that the marked decay of materials like stone is to be attributed directly to moisture expansion alone but when deterioration taken places due to other factors the development of weak planes on the surface and their expansion contributes to their decay.

(iii) *Weathering Associated with Defective Techniques*

Weathering associated with defective techniques and faulty craftsmanship are some of the reasons by which the stone may suffer. This could account for lack of intimate knowledge of building materials and how they are to behave in times to come. This information is required for selection of suitable building stone as has been done for the construction of the Geological Museum at London.

(iv) *Chemical Weathering*

Chemical weathering is due to the reaction of the materials of which the monuments is made and the constituents present in the atmosphere. Chemical decay is associated primarily with materials which are having calcium-carbonates wholly or partly and decay in non-calcareous materials may result due to absorption of decomposition products of nearby calcareous materials. In the air the principal decaying agents are sulphur dioxide and carbon dioxide. In damp leaching of soluble materials proceed apace, oxygenated and carbonated water are the main factors for deterioration. Soda and potash are released by hydrolysis of feldspar and go into solution of carbonate which are potent sources for dissolving of silicate rocks. In tropical condition due to hydrolysis, oxidation and carbonation produce residual products of diversified nature. Complex Alumino-Silicate are decomposed with the formation of kaolin which we are sealing at Konark. In case of further decay the above reaction does not stop at hydrated aluminium state but continues further with the elimination of silica and accumulation of hydrated oxides of iron, Mn, and Al. Chemical weathering is favoured by elimatic conditions.

Stones also behave differently under different conditions; for example, sand stones are more susceptible to deterioration physically than lime stones in humid atmosphere, while schists are brocken down by mechanical action. Basalt has been reported to be most resistant to carbonated water. Quartz is also most resistant.

It is therefore necessary to study the chemical composition of stone, the decaying agents and the cumulative reaction of both to one another as well as mechanical action on these.

A few of the monuments like Ajanta, Ellora, Karla, Bhaja and Elephanta are hewn out of Basalt of uniform mineral composition. The rocks at Elephanta are hard, tough, compact and medium. In all these cases chemical weathering is conspicuous but the physical weathering is also noticed as seen by vents, cracks, etc. The chemical analysis of sound and decayed samples of Elephanta show the hydrolytic decomposition of minerals followed by oxidation, hydration and elimination of some sillica, calcium, Mg. and alkalies have rendered the fabric very weak; salt effect has also produced its own deterioration.

Jogeswari caves are hewn out of soft colcanic agglomerate. Here we find gypsum making its appearance on the surface.

Ajanta trap rocks are in good state of preservation but the sun, wind and rain have also taken their toll in the form of cracks, fissures and cleavage which allow rain water to seep through and produce chemical mineral alteration. Physical deterioration done to thermal action is only moderate.

Ellora temples have similar structures as those at Ajanta and hence they suffer the same fate.

Granite of Gomatesvara statue at Sravanbelgola consist of quartz, feldspar, mica with magnetite and apatite is resistent to chemical weathering-Mica (Biotite) is in the process of alteration—producting red brown limonitic substances. Physical weathering due to thermal difference is 8 to 15°C. Vegetational growth is also seen. Abrading winds also produce their adverse action.

Helebid and Belur temple made of pot stone show signs of chemical weathering on account of hydration, oxidation and carbonation of silicate with formation of carbonates of Fe, Ca, Mg and the liberation of hydrated sillica and alkalies. Ferrous oxide passes into hydrated ferric oxide by oxygen and water with the formation of ochreous discolouration.

Konark temple is built of khondalite stone consisting of quartz, garnet, sillimanite, graphite, orthoclase, etc. The weathered samples show that these are progressively enriched in Al_2O_3 and $Al_2O_3+Fe_2O_3$ as compared with SiO_2. This is attributable to hydrolysis, mineral alteration, oxidation and hydration. Selective removal of alkalies and Silica, precipitation of hydrated aluminium silicates, Ferric oxide (hydroxide) etc.

Mahabalipuram shore temple is made of granite rock which is coarse grained. Mineral alterations have taken place in kaolinization of feldspar and limonitization of iron and chloritisation of biotite which are some of the important occurrences; salt laden winds further aggravate the situation.

Bagh caves are made of sandstone which have become friable due to leaching of calcium cement by water. Rock shows cracks and huge chunks have fallen, thus both chemical and physical weathering is present.

Taj Mahal is made of marble which is mainly calcite along with $MgCO_3$ silica and iron and is of the most beautiful form. It is hard. It has suffered deterioration on account of the marked variation in temperature (18°C); thus thermal expansion causing physical deterioration has been noted. What part the carbonated water is playing is yet to be investigated as is well known that marble dissolves in carbonated water and erosion takes place. The surface of marble has also shown pitting tendency. CO_3 is gradually getting converted into SO_4 with irregular shape and with carbonaceous matter and iron, etc. it is turning dark. Air pollution is taking its own share and since this is a very broad subject, I hesitate to touch it. These oxides of S, N, C are playing their part along with particulate matter, serosols on the surface of Taj.

This is in brief the problem faced by few of the monuments which have been discussed in this work. What should be our endevour and how to preserve it is a million dollar question.

All the factors act either independently or in collusion with one another to produce weathering. Our experience tells that all the above factors, e.g. inherent weakness of building materials, climatic factors, defective techniques, human vandalism, biological and microbiological factors, pollutants are slowly continuing their efforts to destroy, though not marked at first sight and ultimately leading to complete failure of martix of stone and finally to the inevitable, i.e. complete distruction. Science has now made tremendous progress in conservation techniques which go a long way in arresting these processes of decay—chemical disintegrations, physical disturbances, gravity factors, mineralogical and petrological alterations, biological and entomological decay. Disintegration can be slowed down and perhaps be stopped almost if timely preventive and curative measures are taken as a stitch in time saves nine.

Conservation

The main idea behind the conservation is to keep the stone monument in a good state of preservation for posterity and to reduce the rate and incidence of decay in addition to reduce the chances of disintegration and disfigurement. It is realised by all that decay due to various factors is a natural process and we have to live with such state as a matter of usual occurrence. Normally the conservation of stone implies the following:

1. Cleaning.
2. Consolidation.
3. Preservation by the use of surface-coatings.

Cleaning

Cleaning of stone monuments involves the use of different chemicals which are inert to the stone matrix but react at the surface to remove the unwanted resultant materials due to mineral alternations or deposits due to air pollutants. As usual these layers are rarely protective and continuous and are interrupted ones causing more damage to the underlying stone matrix. In this we include the harmful factors like soluble salts, insoluble to sparingly soluble encrustation, soot, particulate matter, vegetational and micro-biological growth, etc. Our important aim is to relieve the stone of the above without damaging and it has been seen that if a too fragile material is to be treated it may cause further deterioration and hence it is better to consolidate it. This is preventive consolidation. Treatment with water and a surface detergent followed by selective techniques of preservation is the usual trend in cleaning. Paper pulp and absorbent clay packs have furnished the best results to date. Sepiolites and attapulgite having similar composition and reticular structure have been used for the removal of encrustations and other unwanted materials. These clays are mixed with the solvents and applied in packs on the surface to be cleaned. This method is advised in case of greasy and waxy surfaces. For soluble salts, water based packs are used.

Dioria and Torracca have reported the use of solvent jellies which are weak basic-solutions to which thickness are added to facilitate as a cleaning agent. The active solution is thus kept in constant touch with the surface to be cleaned. pH of such solutions is kept below 7-8. In order to reduce evaporation of water, the whole area is covered with alkathene once the cleaning is over; mechanical means are employed with the use of bristle brushes, washing in the last stages is done by distilled water. The use of air abrasives with precision has also been made by experts in which a set of abrasive powder, e.g. sand or alumina has been used. This is a mechanical method.

Laser techniques have also been employed by John F. Asmus of the Institute of Geophysics, California for cleaning techniques. This is a method of stone, sculptures cleaning to remove the various encrustation that result on account of stone deterioration. In Italy this has been reported upon. Giant Pulse Ruby-Laser with single pulse 5-1.5.5 is sufficient to clean 1 cm^2 at high cost. It has its disadvantageous also and till now it is only used in laboratory testing conditions.

All those techniques which produce harmful effects and are injurious are to be avoided. Mechanical method which produce superficial temperature change may not be used at all.

For cleaning marble, etc. water mist techniques and urea glycerine-biopack method has been used with considerable success.

Conservation

Consolidation is the second part of the process which increases the cohesive strength, improves upon the mechanical characteristics and leads to adherence of altered layer to the main substratum. Porous materials are very well consolidated due to indepth penetration. However, viscocity of the consolidant has to be adjusted so that the maximum cohesion could be achieved or otherwise formation of scum would take place leading to dangerous results.

Organic and inorganic materials both have been used and both are having advantages and disadvantages. Inorganic materials are more durable than organic but then they are non-elastic. However, organic ones are better suited in improving the treated stone resistence to mechanical stress.

Use of monumers have also been reported upon which were later on polymerized by Gamma radiations. Use of consolidation under vaccum has been done by K. Hempel using sillicone monumers resulting in increased depth of impregnation. A list of consolidants have been prepared after careful trial in which style sillicates, alkyl-trialkoxy silanes, acrylic resin silliconates, dynasilian have been used with good results. Vinyl resins have also been tried. Barium hydrate has been used in some of stone samples. Fluoro-carbon scrylic sillicone have also been tried by Gauri at University of Lousiville-Kentucky and he reported it to be extremely good for atmospheric gas attack. The superiority of epoxy resins has been advocated by many workers (Gauri 1970, Stambolvo, *et al.* 1976. Domaslowaski 1966, Torraca 1976, Marinelli 1976, Rossi Manaresi 1976, Reiderer 1972) in many cases of the consolidation of stones but since these monuments are lying open, the use of synthetic materials is of limited value.

Preservation

After the above two steps have been taken the preservation, i.e. protection against climatic conditions comes in or otherwise difficulties would arise. If it is envisaged to use the same protective coating as consolidant, it should be done to reduce the source of environmental deterioration and to provide surface protection. A large number of coatings are now available but care has to be taken to use only those which have been tried and tested in different climatic conditions. Generally a coating with beatericide or fungicide is used. An ideal preservation coating is yet to be found which fulfils all the conditions like:

1. unaffected by temperature/humidity.
2. it should not change its colours.
3. it should give uniform coating.
4. it should not show any swelling tendency.
5. it should not suffer any decomposition itself.
6. it should be long chained network of simple repeated units.
7. it should be reversible.
8. it should have fluidity.

However, the Archaeological Survey of India is using vinyl, resin, acrylica resins for protective coatings and they are quite effective. However, a lot of synthetic materials are available for use as a coatings. A protective film is a kind of sacrificial type of layer applied to stone surface which with passage of time deteriorates automatically and has to be periodically replaced. From a study of moisture permeability of protective coatings, no substance is known to have complete unpermeability to moisture. Sheds and other devices are helpful to reduce the effect of attritions due to rains. Khandolites of Konark have been treated with polymethly methacrylate some 25 years back and they are now in better state of preservation then the untreated ones. The irreversibility of old acrylytic film is an advantage as it becomes resistant to moisture. Sillicons are other materials which have been used. In fact a large number of synthetic materials are already in the market like arrylates, butyrates, polyesters, silliconates, silance and dynasilanes, but they have to be used with caution. Micro-cystalline wax has been used as a preservative.

Zinc-silico-flouride has been used as cryptogamic killer. Santobrite is another material very often used.

And these are the general methods which have been used by different countries in preserving their cultural heritage

Treatment of Marble

Marble, whether white or coloured, stains very easily and in many cases a stain pre-existed or produced as a result of careless cleaning may become permanent disfigurement.

(1) For removal of superficial dust rubbing with fresh water with the help of a clean soft cloth is sufficient. No efforts should be made to remove natural discolouration of the material.

(2) For removal of surface accumulation of greasy matter, dust, dirt and smoke, rubbing with cloth soaked in the solution of soft soap 10 gm. water 100c.c. and ammonia liq. 1 c.c. is effective.

(3) Removal of thicker and strong adherent fatty accretions is effected with the help of organic solvents, like methylated spirits and rectified spirits, benzene, xylene, petrol, pyridine, etc.

(4) For removal of superficial smoke 5% ammonia in spirit is sometime useful. Deep spotted soot can be removed with the mixture of toluene, methyl alcohol and strong ammonia and tri Ethanol amonia.

(5) Stains can be tried with the mixture of benzene or methylated spirit, ammonia liq. and methylated spirit (equal parts by volume). Colour stains can be removed with dilute solution of chloramine T or hydrogen peroxide.

(6) Use of abrasive is forbidden.

8

Epilogue

As per the Indian Constitution, Archaeology is a concurrent subject, and the maintenance and upkeep of the monumental edifices in the country are looked after by the Central as well as the State Governments. Accordingly the monuments and sites of national importance come under the purview of the Central Government while those of local importance are taken care of by the respective State Governments. As to the number of such monuments it may be stated that India is a vast country with rich cultural heritage of remote past, and the number of such monuments is pretty large. The requirement of funds for their proper maintenance and upkeep would be quite enormous and as such only a limited number of them are well looked after. The conservation or preservation works are carried only at some selected monuments of international repute or those which are frequently visited by pilgrims or visitors. Though the monuments in the country, are protected by the Central and State Governments, but much remains to be done in the field of their proper maintenance and upkeep. There are instances in which one finds that no conservation works have been carried out in certain monuments for decades together, and if adequate steps for their preservation are not taken, some of them might be lost to the posterity forever. For the proper maintenance of all the monuments in the country, it would be essential that (i) all these neglected edifices be properly surveyed and the details of repairs worked out (ii) for the problemetic conservation works, suitable expertise from the country or outside be invited, as has been done in the case of the conservation of Bagh caves and the frescoes of Ajanta. It would be quite pertinent to say that our conservation engineers and experts are one of the best in the world and have to their credit many achievements, which any country could be proud of, but the difficulty lies in the proper direction in the execution of these works or the congenial atmosphere in which the works are to be executed. It would be in the best interest of the ancient edifices, if proper coordination and cohesiveness is maintained for the purpose.

The protection laws in the country, broadly speaking could be divided into two distinct periods, viz. British and Post-British period. Prior to the British occupation of India, no codified volume of such laws is forthcoming. Perhaps it was not necessary also in the then prevailing circumstances. The epigraphical records stand testimony to the fact that the desecration of a temple and misappropriation of funds meant for the maintenance of such edifices were offences touching immorality and sinful deeds and the prople at large could ill afford to indulge in such acts for fear of religion or religious sanctions, sometimes resulting in condemnation of the concerned individual or individuals or declaring them outcastes from the society. Such religious sanctions had their deterrent effects on the people at large.

After the coming of Muslims in the country by the close of the 10th century A.D. the desecration and destruction of Hindu temples became quite widespread, but the Muslim rulers resorted to almost identical method to safeguard against destruction of the edifices erected by them. In a number of cases the epigraphs at Muslim edifices forewarn the offender that any destructive act in respect of the concerned edifice would throw him in hell, or the wrath of Almighty would befall on him.

During the British period the framing of antiquarian laws was a slow and steady process, which was necessitated keeping in view the exegencies of the given situation or circumstances. The antiquarian laws framed by the British emphasised mainly on the penal clauses for the defaulters than the moral outlook. Indeed the former were more purposeful than the latter.

The antiquarian laws from the British period onwards, though they have been modifiod in the country from time to time, but in spite of their having served the country for so long, had some deficiencies in their application or operation. The foremost amongst those is the unabated encroachments of the area around the protected monuments and vandalism. Though some of the Archaeological officers in the country have been vested with some judicial powers for the purpose of dealing with such encroachments, but these powers are not enough, because none of these officers have any legal background, which is essentially required for the purpose of dealing with such legal matters. In a number of cases, therefore, these delegated legal powers to the Archaeological officers have served no useful purpose. The foremost need in this connection would be to make laws against encroachment of land around the national edifices more effective and deterrent and their implementation should be taken care of by the experts in the field.

The other problem at the ancient edifices has been the vandalism, which has deprived the country of the valuable artefacts, which were exported out of the country. Though due to certain international laws and the UNESCO conventions which have come up in the last few decades, it has been possible to recover back some of them, but still much remains to the done. For this purpose, efforts are required to be made at national as well as international levels. Another aspect of the problem is the safety at the monuments. In spite of the strenuous efforts made in the country for the purpose, it has not been possible to device a fool-proof method to safeguard the antiquarian remains. This is primarily due to the fact that most of the monumental edifices in the country are located in remote or inaccessible localities and it is physically impossible to provide fool-proof security cover to them. In spite of all the hazards, much could be achieved by creating an awareness amongst the local populace about the importance of the cultural heritage.

In so far as the improvement of the environments around the monuments is concerned, it would be essential to save them from natural as well as man-made causes of destruction.

More care is required for the monuments lying near the sea-shore or river banks because regular efforts would be required to protect the soil erosion and the ill-effects of sea-breeze having saline contents. The other aspect is the development of horticultural activities around the monuments. Some of the Mughal edifices did have beautiful gardens attached to them at the time of their protection, but some of them have been provided with gardens and lawns in the past few decades. Though much has been done in the fields of protection of ancient edifices yet fool-proof methods for their total protection are yet to be devised. In the field of their maintenance, upkeep and the environmental development, much remains to be done.

Appendices

Appendix I

Chronological Development of the Concept of Conservation of Ancient Monuments in India, During the British and Post-British Period, and the Various Laws and Enactments passed by the Government of India in this Regard

Sl. No.	*Year*		*Title of the Act or the Govt. Authority*	*Basic Concept of Conservation of Ancient Monuments enshrined therein.*	*Remarks*
1	2	3	4	5	6
1.	1784	Formation of Royal Asiatic Society of Bengal, Calcutta.	The Society was formed for study, cultivation and preservation of history and culture of India.	The extent of preservation of conservation work to be done or the agency responsible for carrying-out the source of finances for execution of such works remained undefined.	
2.		Bengal Code	Under this legislation the Managing Board or Trustees Boards were formed for the maintenance and conservation of selected monuments.	The cost of maintenance was to be met out of the revenues earned from the lands, etc. attached to the monuments.	
3.	1817	Madras Code (Act-VII)	--do--	--do--	
4.	1863	Act - XX	--do--	Under the provisions of this act, no persons other than those appointed by the Government, as Members of the Board of Management were allowed to manage any monument or property under the charge of Government. The sources of revenue	

however, remained the same as at 2 or 3 above. It also empowered

1	2	3	4	5	6
				the Government to prevent injury to ancient edifices and to preserve buildings remarkable for their historical or architectural value.	
5.	1867	Central Government	In a policy decision, it was recognised in principle that it was the Government's duty not only to conserve all historical monuments but also to encourage exploration of others yet to be discovered.		
6.	1870	Duke of Argyll, Secretary of State of India.	Emergence of the idea that "the antiquities were instructive only when preserved in their original context."		
7.	1873	Government Directive	All provincial Governments in India were directed that "duty for carrying out the preservation of all buildings and monuments of historical and architectural interest", was that of the Government.		
8.	1878	Indian Treasure Trove Act.	In the absence of any legal provisions it was possible for the Govt. to take possession of any one finding object of value or even a pot while digging into earth for drawing a well or a foundation of a structure. The act made it obligatory for the finder of a structure to report the matter to the Government. It	In the event of an object being more than one hundred years old, the property automatically belonged to the Government.	

further empowered the Government for the compulsory acquisition of antiquities.

1	2	3	4	5	6
9.	1879	Central Government	Proposal for the sanction of grants to Provincial Government for the preservation of ancient monuments was mooted.		
10.	1904	Ancient Monuments	(a) for the Preservation of ancient monuments, to exercise control over traffic in antiquities and over excavation in certain places and for protection or acquisition of certain ancient monuments and objects of archaeological, historical and artistic interest, this Act was passed. (b) (i) According to this Act the maintenance of a monument including repairing, restoration of protected area of a monument and doing of any act which may be necessary for the purpose of proper maintenance and up-keep of the protected monuments and securing convenient access thereto, was enjoined upon the Government. (ii) It also empowered the Central Government to declare any ancient monument to be a protected monument, conservation of which was the responsibility of the local Governments.	1. The responsibility for maintenance of the protected monuments was enjoined upon the local Govt. But voluntary contributions could also be accepted by Government for the repairs of certain Monuments under certain prescribed conditions. 2. Violation of the provisions of the Act was made a panel offence.	

1	2	3	4	5	6
			(iii) Government could purchase an ancient monument. (iv) Government also acquired the right to prohibit or restrict, taking by sea or land any antiquity or class of antiquity from the country.		
11.	1919	Government of India (Education Department) Resolution No. 48 of 21st February, 1919.	I. Classification of protected and unprotected monuments for the purpose of Conservation was laid down: 1. Those monuments which from their present condition of archaeological or historical value, ought to be maintained on permanent good repair. 2. Those monuments which were required to be saved from further decay by such measure as eradication of vegitation, the exclusion of water from the wall and the like. 3. Those monuments which were in advanced stage of decay or comparatively unimportant and therefore it was impossible or unnecessary to preserve them.	(a) It was conceived that it would often be necessary to carry out initial repairs over and above those specified, in order to put a building in such a state that those minor measures would afterwards suffice to keep it in tolerably good condition. (b) It was decided that in case a building was in dilapidated condition, it did not follow that any measures should be permitted, which would end to hasten its decay. It will be a monument of interest as long as its fabric is held together.	

1	2	3	4	5	6
			II. The monuments at 1 & 2 above were further devided into those: (a) Owned and maintained by Govt. (b) Owned and maintained by Private Owners. (c) Owned by private persons but maintained by owners and the government jointly or exclusively by the Government.		
12.	1922	Conservation Manual by Sir John Marshall.	The following principles of conservation were enunciated:- (i) Hypothetical restorations are unwarranted, unless they are essential to the stability of the building. (ii) Every original member of a building should be preserved intact and demolition and reconstruction should be undertaken only if the structure could not be maintained otherwise. (iii) Restoration of carved stones, carved wood or plaster moulding should be undertaken only if the artisans were able to succeed in reproducing the excellence of the old. (iv)In no case should mythological or other scenses be recarved.	The conservation of ancient monuments still remained mainly the responsibility of the Local Governments.	

1	*2*	*3*	*4*	*5*	*6*
13.	1932	Ancient Monuments Preservation (Amendment) Act	The amendment to the Act—envisaged controlling of mining operations around the monuments, to regulate excavations in the country and to acquire protected area.	The Conservation works continued to be undertaken by the Local Governments.	
14.	1935	Indian Act of 1935	It made archaeology a Central subject completely leaving the preservation works.	The Conservation works continued to be undertaken by the Local Governments.	
15.	1945	Central Government order	--	The responsibility for preservation of monuments was taken over from the State Government by the Archaeological Survey of India and the relative expenditure on conservation works was to be met by the Archaeological Survey of India.	
16.	1950	Constitution of India	The Constitution of India, made far reaching changes in the position of archaeology in the country. Instead of archaeology being a completely Central subject, as laid down in Government of India's Act of 1935, the Constitution prescribed that the monuments of national importance be maintained by the Government of India, while those of Local importance be maintained by the Local Governments.	Expenditure on preservation, etc. of such of the ancient monuments which were of national importance was to be met by the Central Government, and those of local importance by the respective Governments.	
17.	1951	The Ancient and Historical Monuments and	Conservation Policy remained unchanged, but the conservation	Expenditure on preservation, etc. of such of the ancient monuments	

1	*2*	*3*	*4*	*5*	*6*
		Archaeological Sites and Remains (Declaration of National Importance) Act	works were restricted by the Central Government to the monuments of National Importance only.	as were of national importance was to be met by the Central Government.	
18.	1956	States Re-Organisation Act (Clause-126)	--	--	
19.	1958	Ancient Monuments and Archaeoligical Sites and Remains Act 1958	The provisions of the Act of 1904 were improved upon by the introduction of this Act. The policy of conservation of Ancient monuments under this Act, however remained unchanged though there was a slight change in the definition, in relation to the preservation of ancient monuments with its grammatical variations and cognate expressions, included covering in, repairing, restoration or cleaning of protected monuments and the doing any act which might be necessary for the purpose of preserving protected monuments or of securing convenient access thereto.	The offences relating to the destruction, removal, injury, alteration, defacement, or misuse, etc. of a protected monument or removal from any monuments any sculpture, carving, image, bas-relief, carving, inscription, or other similar objects were made cognizable offence.	
20.	1972	Antiquities and Art Treasures Act, 1972	It defined the "antiquities" in a more comprehensive manner, making it obligatory on the owners to regulate the art treasures and other antiquities possessed by them and to register with the Registering Officers posted at different places in the country.	The enactment was introduced to regulate the export trade in antiquities and art treasures in the country.	

Appendix II

Chart Showing the Definition of 'Treasure' or Antiquity under various Acts of the Government of India

	Title of the Act	*Definition of Treasure or Antiquity*
1.	The Indian Treasure Trove Act, 1878.	'Treasure' means anything of any value, hidden in the soil or in anything affixed thereto.
2.	The Ancient Monument Preservation Act, 1904.	'Antiquities' include any movable objects, which the Government, by reason of their historical or archaeological associations, may think it necessary to protect against injury, removal or dispossion.
3.	The Antiquities Export Control Act, 1947.	"Antiquity" includes: (1) any coin, sculpture, manuscript, epigraph, or other work of art or craftsmanship. (2) any article, object or thing detached from a building or cave. (3) any article, object or thing illustrative of science, art, crafts, literature, religion, customs, morals, or politics in bygone ages. (4) any article, object or thing declared by the Central Government by notification in the Official Gazette to be an antiquity for the purpose of this Act. Which has been in existence for not less than one hundred years.
4.	The Ancient Monuments and Archaeological Sites and Remains Act, 1958.	"Antiquity" includes: (1) any coin, sculpture, manuscript, epigraph or other work of art and craftsmanship. (2) any article, object or thing, detached from a building or cave. (3) any article, object or thing, illustration of science, art, crafts, literature, religion, customs, morals, or politics in bygone days.

Title of the Act	*Definition of Treasure or Antiquity*
	(4) any article, object, or thing declared by the Central Government by notification in the Official Gazettee to be an antiquity for the purpose of this Act, which has been in existence for not less than one hundred years.
5. The Antiquities	I. "Antiquities Includes: (i) any coin, sculpture, painting, epigraph, or other work of art, or craftmanship. (ii) any article object or thing detached from a building or a cave. (iii) any article, object or thing, illustrative of science, art, crafts, literature, religion, customs, morals or politics of bygone days. (iv) any article, object or thing or of historical interest. (v) any article object or thing declared by the Central Government by notification in Official Gazette to be an antiquity for the purpose of this Act, which has been in existence for not less than one hundred years, and II. any manuscript, record or other document which is of scientific, aesthetic value, historical, literary and which has been in existence for not less than seventy-five years. III. "art treasure" means any human work of art not being an antiquity, declared by the Central Government by notification in the Official Gazette to be an art treasure for the purposes of this Act having regard to its artistic or aesthetic value: Provided that no declaration under this clause shall be made in respect of any such work of art, so long as the author is alive.

Appendix III

1. Extract From Bengal Regulation XIX of 1810

(1) Whereas considerable endowments have been granted in land by preceding Governments of this country and by individuals for the support of Mosques, Hindu Temples and other beneficial purposes, and whereas there are grounds to suppose that the produce of such land is in many instances appropriated, contrary to the intentions of the donars, to the personal use of the individuals in the immediate charge and possession of such endowments, and whereas it is an important duty of every Government to provide that all such endowments be applied according to the real interest and will of the grantor, and whereas it is moreover essential to provide for the maintenance and repair of buildings which have been erected either at the expense of the Government or of individuals for the use and convenience of the public and also to establish proper rules for the custody and disposal of nazul property . . . the following rules have been enacted to be in force. . . .

(2) The general superintendence of all lands, granted for the support of Mosques, Hindu Temples, and for other pious and beneficial purposes and of all public buildings such as bridges . . . . . et . . . . and other edifices, is heavily vested in the Board of Revenue.

(3) It shall be the duty of the Board of Revenue to take care of all endowments made for the maintenance of establishments of the above description and which be duly appropriated to the purpose for which they were destined by Government or individual by whom such endowments were granted.

In like manner, it shall be the duty of the Board of Revenue to provide with the sanction of the State Government for the due repair and maintenance of all the expenses of the former or present Government or of individuals and which either at present are or can conveniently be rendered conducive to the concurrence of the community.

(4) In those cases in which, any of the buildings in question have fallen to decay, and cannot, from that or other causes be conveniently repaired, or are not calculated if repaired to afford any material accommodation to public, the Board shall recommend that they be sold on public account or otherwise dispose of as may appear most expedient.

(5) Under the foregoing rules it will of course be incumbent on the Board of Revenue to prevent any lands which have been granted for the support of establishments of the above description from being converted to the private use of individuals or appropriated in any other mode contrary to the intent and will of the donor, and likewise to prevent all edifices from being usurped by individuals and falling into the possession and exclusive use of private persons.

(6) Whereas the Board of Revenue, may be of the opinion that any of the above mentioned edifices require repair, they shall obtain the necessary estimates of the expense required for the execution of work, and forward them to the State Government for approval.

Appendix IV

2. Extracts From Madras Regulation-VII of 1817

(1) Whereas considerable endowments have been granted in many or by assignment of land or of the produce or portions of the produce of land by former Government of this country and the individuals for the support of mosques, Hindu temples, colleges, etc. and for other pious and beneficial purposes, and whereas there are grounds to believe that the produce of such endowments is in many instances have been appropriated contrary to the intentions of donors, to the personal use of the individuals in immediate charge and possession of such endowments, and whereas it is the duty of Government to provide that all such endowments be applied according to the real will and intent of the grantor and whereas it is more expedient to provide for the maintenance and repair of the bridges and other buildings which have been erected at Government expense or of individuals for the use and convenience of public and also to establish proper rules of custody and disposal of escheat, the Rules have been framed.

(2) The general superintendence of all endowments, in land or money granted for the support of mosques, Hindu temples or colleges, or for other pious or beneficial purposes, and all public buildings . . . . is hereby vested in the Board of Revenue.

(3) It shall be the duty of the Board of Revenue to take such measures as may be necessary to ensure that all endowments made for maintenance of establishments of the description above mentioned are duly appropriated to the purpose for which they were destined by the Government or the individuals by whom such endowments were made. In like manner, it shall be the duty of the Board to provide for the due repair and maintenance of all expenses either of the former or present Government or of individuals and which either are or can be rendered conducive to the convenience of the community.

(4) In those cases, however, in which any of the buildings specified in the preceding section have fallen to decay and cannot be conveniently repaired, or are not calculated, if repaired, to afford any material accommodation, to the public, the Board of Revenue shall submit (to the State Government) their opinion as to the most expeditious mode of disposing of such buildings and they shall be sold on the public account or otherwise disposed of, as the (State Government) may determine.

Appendix V

3. Extract from the Religious Endowments Act, 1863 (Act-XX of 1863)

(1) Whereas it is expedient to relieve the Board of Revenue and the local Agents, in the Presidency of Fort Williams in Bengal and the Presidency of Fort St. George for the duties imposed on them by Regulation XIX-1810, of Bengal Code (for the due appropriation of rents and produce of lands granted for the support of mosques, Hindu temples, colleges, and other purposes, for the maintenance and repairs of bridges, Sarais, Kathras, and other public buildings, and for custody and disposal of Nazul Property or Escheats) and Regulation-VIII-1817, of the Madras Code, (for the due appropriation of the rents and produce of lands granted for the support of mosques, Hindu temples and colleges and other public purposes, for the maintenance and repair of buildings . . . and other public buildings . . . . so far as those duties embrace the superintendence of lands granted for the support of mosques, Hindu temples and for other religious uses, the appropriation of endowments made for the maintenance of such religious establishments; the repair and preservation of buildings connected therewith, and appointment of trustees or managers thereof, or involve any connection with management of such religious establishments. . . . .

Clause: 3: In the case of every mosque, temple or other religious establishment to which the provisions of either of the Regulations specified in the preamble of this Act are applicable, the nomination of the trustee, manager or superintendent thereof, at any time of the passing of this Act is vested in or may be exercised by the Government or any public office or in which the nomination of such trustee, manager or superintendent shall be subject to the confirmation of the Government or any public offices, the State Government shall as soon as possible after the passing of this Act make special provision as hereinafter provided.

Clause: 23: Nothing in this Act shall be held to affect the provisions of the Regulations mentioned in this Act except in so far as they relate to mosque, Hindu temples and other religious establishments, or to prevent the Government from taking such steps as it may be necessary under the provisions of the said Regulations to prevent injury to and preserve buildings remarkable for their antiquity or for their historical, architectural value or required for the convenience of the public.

Appendix VI

Extracts From Indian Treasure Trove Act, 1878

Interpretation Clause Treasure

Section 3. In this Act:

"treasure" means anything of any value hidden in the soil, or in anything affixed thereto.

Collector

"Collector" means (1) any Revenue Officer in independent charge of a district, and (2) any officer appointed by the Local Government to perform the functions of a collector under this Act.

Owner

When any person is entitled, under any reservation in an instrument of treasure of any land or thing affixed thereto, to treasure in each such land or thing, he shall, for the purpose of this Act, be deemed to be the owner of such land or thing.

Section 4.

Procedure on Finding Treasure
Notice by finder of Treasure

Whenever any treasure exceeding in amount over the value of ten rupees is found, the finder, shall, as soon practicable, give to the Collector notice in writing

(a) of the nature and amount or approximate value of such treasure;
(b) of the place in which it was found;
(c) of the date of the finding;
and either deposit the treasure in the nearest Government Treasury, or give the Collector such security as the Collector thinks fit, to produce the treasure at such time and place as he may from time to time require.

Penalties on the finder failing to give notice etc.

Section 20

If a finder of any treasure fails to give the notice or does not either make the deposit or give the security required by section 4, or attempts to alter such treasure so as to conceal its identity, the share of such treasure or the money in lieu thereof to which he would otherwise be entitled, shall vest in His Majesty;
and he shall, on conviction before a Magistrate be punished with imprisonment for a term which may extend to one year or with fine, or both.

Appendix VII

Extract from Section 33(I) & (J) of Estate Duty Act, 1953

Part III, Exceptions from the charge of Duty etc.

(I) Drawings, paintings, prints, manuscripts works of art or archaeological or scientific collections which are of national, scientific or historical interest and which are retained in the family of the deceased and dealt with or disposed of in accordance with such conditions as the Board may prescribe or which are given absolutely or bequeathed to Government or to any university or other public institutions.

(J) Drawings, paintings, photographs, prints, manuscripts and other heir-loom, not falling within Clause (*i*) which are national in the family of the deceased and are dealt with or disposed of in accordance with such conditions, as the Board may prescribe and are not intended for sale.

Appendix VIII

Extract from Section 5(I), (XII) & (XIII) of the Wealth Tax Act, 1957

(5)(I) Wealth Tax shall not be payable by any assessee in respect of the following assets and such assets shall not be included in the net wealth of the assessee:

x x x

(XII) any work of art, archaeological, scientific or art collections, books or manuscripts belonging to the assessee, and not included for sale;

(XIII) any drawings, paintings, photographs, prints or any other heir-loom not falling within clause (XII) and not intended for sale, but not including jewellary.

Appendix IX

Extract from Sections II of Arms Act, 1959

Section II. The Central Government may, by notification in the official Gazette, prohibit the bringing into, or taking out of India, arms or ammunition of such classes and discriptions as may be specified in the notification.

Appendix X

Extracts from Income Tax Act, 1961

Section 47. Nothing contained in Section 45 shall apply to the following transfers:

(IX) any transfer of a capital asset, being any work of art, archaeological, scientific or art collection, book, manuscript, drawing, painting or photographs or print, to the Government or a University or the National Art Gallery, National Archives, any other such public museum or institution as may be notified by the Central Government in the official Gazette to be of national importance or to be of renown throughout any State or States.

Explanation:--For the purpose of this Clause, 'University, means a University established or incorporated by or under a Central or Provincial Act and includes an institution declared under section 3 of the University Grants Commission Act, 1956 to be a University for the purposes of this Act.

Appendix XI

Extracts from Customs Act, 1962

Chapter-IV B, Section II-I,

Power of Central Govt. Specify goods:

Clause-II-I; If having regard to the magnitude of the illegal export of goods of any class or description, the Central Govt. is satisfied that it is expedient in the public interest to take special measures for the purpose of checking the illegal export or facilitating the detection of goods, which are likely to be illegally exported, it may, by notification in an official Gazette, specify goods of such class or description.

Appendix XII

Extracts from Customs Act, 1962

Section 50 (i): The exporter of any goods shall make entry thereof by presenting to the proper officer in the case of goods to be exported in a vessel or an aircraft, a shipping bill, and in case of goods to be exported by land, a bill of export in the prescribed form.

(ii) The exporter of any goods, while presenting a shipping bill, shall at the foot thereof make a declaration as to the truth of its contents.

Section 133: The following export goods shall be liable to consideration:

(a) any goods attempted to be exported by sea or air from any place other than the customs port or a customs airport, appointed for the loading of such goods.

(b) any goods attempted to be exported by land or in water through any routes other than a route specified in a notification issued under clause (C) of section 7 for the export of such goods;

(c) any dutiable or prohibited goods brought near the land frontier or the coasts of India or near any bay, gulf, creek or tidal river for the purpose of being exported from a place other than a land customs station or a customs port appointed for the loading of such goods;

(d) any goods attempted to be exported or brought within the limits of any customs area for the purpose of being exported, contrary to any prohibition imposed by or under this Act or any other law for the time being in force;

(e) any dutiable or prohibited goods concealed in a package which is brought within the limits of a customs area for the purpose of exportation;

(f) any dutiable or prohibited goods which are loaded or attempted to be loaded in contravention of the provision of section 33 or section 34;

(g) any dutiable or prohibited goods loaded or attempted to be loaded on any conveyance or water-borne, or attempted to be water borne for being loaded on any vessel, the eventual destination of which is a place outside India without permission of the proper officer;

(h) any dutiable or prohibited goods which are not included or are in excess of those included in the entry made under this Act or in case of baggage in the declaration made under Section 77;

(i) any dutiable or prohibited goods or goods entered for exportation under claim for drawback which do not correspond within any material particular with the entry made under this Act or in the case of baggage with the declaration made under Section 77 in respect thereof.

(j) any goods on which import duty has not been paid and which are entered for exportation under a claim for drawback under section 74;

(k) any goods cleared for exportation under a claim for drawback within are not loaded for exportation on account of any wilful act, negligence or default of the exporter, his agent or employee or which after having been loaded for exportation are unloaded with permission of the proper officer.

(l) any specified goods in relation to which any provision of Chapter IV-B, or of any rule made under this Act, for carrying out the purpose of that chapter have been contravened.

Appendix XIII

Chart Showing the Definition of Monuments Under Various Acts of the Government of India

	Title of the Act	*Definition of "Ancient Monuments"*
1.	The Ancient Monument Preservation Act, 1904	"Ancient Monument" means any structure, erection or monument or any temple or place of interest or any cave, rock-shelter, inscription or monolith which is of historical, archaeological, or artistic interest, or any remains thereof and includes: (a) the site of an ancient monument, (b) such portion of land adjoining the site of an ancient monument as may be required for fencing or covering in or otherwise preserving such monument, and (c) the means of access to and convenient inspection of ancient monuments.
2.	The Ancient and Historical Monuments and Archaeological Sites and Remains (Declaration) National Importance Act, 1951	All ancient and historical monuments and all archaeological sites and remains declared by this Act to be of national importance shall be deemed to be protected monuments and protected areas respectively within the meaning of
3.	States Reorganisation Act, 1956	Ancient Monuments Act, 1904, and provision of that act shall apply accordingly to the ancient and historical monuments or archaeological sites and remains, as the case may be and shall be deemed to have so applied at all relevant times.
4.	The Ancient Monuments	"Ancient Monument" means any structure, erection or monument, or any tumulus or place of interest or any cave, rock-shelter, inscription or monolith, which is of historical, archaeological or artistic interest, and which has been in existence for not less than one hundred years, and includes:

(a) the remains of an ancient monument,

(b) the site of an ancient monument,

(c) such portion of land adjoining the site of an ancient monument as may be required for fencing or covering in or otherwise preserving such monument, and

(d) the means of access to, and convenient inspection of an ancient monument.

Appendix XIV

Flora, Forestry and Trees mentioned in the Mahabharta.

Agru -- Aquilaria agallocha. (Dron-34-16; Santi-170-18).
Arjuna -- Terminalia Arjuna.
Arani -- Premna Intergrifolia.
Asoka -- Saraca asoca (Adi, -262, 48, Dron, 131-51, Anu, 32-7; Vana, 64-10).
Karnikar -- Pterospermcom acerijelina, (Vana, 158-66, Udyoga, 22-29).
Varaija -- Ponganaia pinnata, (Vana-230-35).
Kalpa, (Karna - 93.44).
Aka -- Colotropis gigantea, (Udyoga, 100-10; Vana-3.42, Sabha-10-7).
Amra -- Mangifera Indica, (Vana, 158-61).
Ingudi -- Balanites rox burghy, (Anu, 142-7).
Indrayana -- Citrullus Colocynthis.
Udumbara - Ficus racemosa (Santi, 194-39; Anu, 4-27).
Kalabhra -- Andrographis pancuiala, (Bhishm-7-14).
Kasa -- Saccharum spontancum.
Kimsuka -- Butea-manosperma, (Bhism, 53-23).
Kutaja -- Holarrhena antidycenterica.
Kunda -- Jasminum pubescens, (Vana, 119.4, 27 and 29).
Kurbok -- Barleria cristata, (Vana, 158-66, 67).
Kusa -- Enagrostis Cynosuroides (Santi, 196-14).
Kerava, (Drona-23-62).
Kovidara -- Bauhinia Variegata.
Khadira -- Acacia Catechu, (Santi, 36-40).
Khas -- Vetineria Zizanioides, (Udyoga, 191-21).
Giri Karni -- Clitoria ternota.
Chandana -- Santalum Album, (Dron, 34-16; Virat, 20-24; Vana, 200-24).
Champaka -- Michedia Champaca, (Anu, 42-16; Virat, 55-10).
Jambu -- Syzygium Cumini (Bhishma, 7-20).
Tala -- Barassus Flaliellifer, (Virata 14-15; Adi, 39-86).
Tinduka -- Diospyros Embryopteris, (Udyog-133-14).
Til -- Sesamun indicum, (Vana 279-37).
Tosi -- Linum usitatissimum, (Dron. 29-20; Vana. 188-95).
Tejapata -- Cinnamonum tamala (Santi, 170-18).
Dadim -- Punica granatum or pomegranate, (Karna-2130).
Narkula -- Phrogmites Karka, (Vana 107-3).
Plaksha -- Ficus Virens, (Vana-93-10).
Patala -- Stereospermum Suaveolens, (Dron, 23-16).
Parijata -- Vyctanthes arbortristis, (Adi-18-37, Stri-12-19).

Badar -- Ziziphus mauritania, (Vana, 145-17).
Bhimba -- Coccinia indeia, (Asva, 46.4).
Mahasankha, (Salya, 37.21).
Manju -- Sacehrum munja, (Vana, 11.19).
Rendi -- Ricinus Communis, (Anu, 142-7).
Lasodha -- Cardia obliqua, (Vana, 134-38).
Lodhra -- Symplocos racemosa.
Vamsa -- Bamlusa arundinacca, (Adi, 62-17, Virata, 21-3).
Vata -- Ficus benghalansis, (Vana, 72-41).
Vetus -- Calamus, (Vana, 186-28-29).
Sami -- Prosopis specigera.
Sar -- Saccharum bengalensis, (Vana, 225-10).
Salmali -- Bonbax Ceiba, (Santi-154-5, Udyog, 75-19).
Sala -- Shrorea robusta, (Bhishma, 7-14, Virata-17-12).
Sirish -- Albizia lebbeck, (Bhishima, 79-21).
Simsapa -- Dalbergia Sissod, (Adi, 58-26).
Saptaparna -- Alstonia Scholaris.
Sarso -- Brassica Campestris.
Sinduvara, (Anu, 98-17).
Kshiri -- Fcius arnothiana, (Bhishma, 8-4, 5).
Ankola -- Alangium Salvifolium.
Anjir -- Fcius carica Linn.
Aimukta -- Hiptage bengalensis.
Amlveta -- Garcinia pedunculata Roxb.
Amlaka -- Emblica officinalis.
Lackuk -- Artocarpurs Lakoocha.
Saral -- Pinux roburghi.

Appendix XV

List of Trees and and Plants Mentioned in the Varaha and Vamana Puranas

Tree	*Varaha Purana*	*Vamana Purana*
Agru	101.3, 103.3, 104.4 178.108, 179.11, 194.31.	17.60, 36.13, 26, 58.8, 68.20
Ankol		6.19.
Atasi		44.34.
Atimukta		36.13.
Abj	9.32, 45.3, 60.7, 73.28.	
Ambuaja	127.45	36.25.
Abjini		38.57.
Arvinda	184.31	58.42.
Arka	155.13, 158.20	17.55, 44.86.
Arjuna	17.12, 123.45, 138.70 154.4, 155.21.	1.18, 58.9.
Asoka	11.33, 91.14, 125.45, 150.26.	12.51, 62.18, 68.12.
Asvatha	77.23, 125.78, 126.34, 127.4, 147.94.	14.37, 18.8, 15.32, 58.69
Asvaparna	117.94.	
Amolaka	99.5, 117.29, 146.66	17.55, 59.8, 68.28.
Amra (Mango)	55.42, 146.64, 168.24.	
Ikshu	54.17, 99.9, 100.3, 101.4, 102.7, 103.4, 106.5, 107.2, 109.8.	62.17, 64.43.
Utpal	69.18, 78.8, 82.16, 122.8	3.47, 58.17.
Udumbara	80.1, 118.6, 126.35, 127.16	15.13, 17.40.
Usira	179.2	12.7, 68.19.
Kadamba	17.12, 77.11, 123.45, 138.70	1.18, 17.9, 18.2, 26.71, 58.8.
Kadali	201.26, 213.17	7.11.
Kamala	1.22, 24.11, 55.41, 73.27, 78.8, 89.37.	6.17, 22.32, 31.20.
Karavira	125.52	17.36, 50.36, 68.12.
Karira	154.4.	
Karkata	117.26.	
Karnikara		6.12, 58.8.
Kalahara	78.8, 122.8, 138.76, 211.21	6.12, 58.8.
Kalamra	82.20.	
Kalayaka	180.27.	
Kamaehi		12.53.

Kamchaua		58.17.
Karpasa		12.52, 15.6.
Kimsuka	80.26	4.29, 6.9, 16.46.
Kichaka		58.18.
Kumkuma		68.19.
Kutaja	123.45, 138.70.	
Kunda	151.35, 184.26, 194.23, 211.17, 213.18	6.11, 17.47, 18.6, 27.12, 68.12.
Kumuda	78.9, 80.50, 82.24, 122.8, 148.30, 184.26.	22.32, 58.17.
Kultha	118.11.	
Kusa	34.14, 47.10, 126.13, 127.53, 136.48, 155.17, 158.20.	17.42, 26.17, 25.42, 46.45.
Ketaki	211.17	1.18, 68.14.
Kesara	183.5	6.99.
Kshiravriksha	84.5, 98.18.	
Khadira	127.54, 151.42	18.5.
Kharjura	80.70.	
Gandhapatra	122.35.	
Guggulu		17.19.
Gulma	148.29, 162.2, 206.50	
Godhuma	8.22, 33.29, 38.11, 58.10, 114.21.	68.21.
Chandana	50.9, 103.3, 104.4, 159.26, 174.7, 178.109, 179.12, 180.27.	
Champaka	13.33, 91.14	6.98, 58.8, 68.12.
Japakususma	68.10	6.98, 58.8, 68.12.
Jambhira	168.24.	
Jambu	77.17, 140.73, 166.8.	
Jati		6.101, 12.50, 68.12.
Jatiphal		68.20.
Tagara		70.40.
Tanduliya	177.8.	
Tamola	79.21, 149.37, 151.49, 154.4, 155.37, 197.26, 198.1.	2.49, 12.54, 16.47, 42.48.
Tila	13.56, 14.25, 34.15, 39.44 and many others.	15.6, 17.35, 18.13, etc.
Tusushka	181.23.	
Trina	11.20, 52.11, 213.6.	
Darbha	5.47, 14.16, 99.8, etc.	10.80.
Dadim	170.36	64.97.
Draksha	80.70.	
Devadaru		68.48.

Dhattura		16.32, 17.32, 18.4, 36.12.
Natini	194.5	
Nagara		12.54.
Nagakesara	11.33, 91.14	68.13.
Naranga	161.24.	68.13.
Nalikera	53.15.	
Nipa	17.12	
Nilolpala	89.19, 155.84	1.22, 6.13, 58.8.
Nyagrodha	77.27, 81.55, 843 etc.	17.13.
Pauchamra	170.36	38.68, 60.24.
Panasa	82.16.	
Patola		54.19.
Parijata	69.28	36.13.
Pathya		12.51.
Palasa		6.10, 18.7, 62.17.
Paribhadra		68.13.
Pichumand	170.36.	
Pipal	117.26, 158.64.	
Piluka	154.4.	
Pitaka		68.13.
Pundarika	6.10, 79.3, 140.30	58.17, 62.14.
Purrajiva	127.70	62.21.
Punnaga	11.33, 91.14	58.8.
Pushkara	21.72, 49.2	41.40, 58.53.
Bokula		6.99, 68.13.
Badori	16.24, 48.7, 144.60	
Bibhitaka	177.8.	
Bilva		1.22, 6.18, 18.8, 36.12, 58.8.
Bhadra		17.38.
Bhringa		6.21, 68.15.
Madhuka	117.26	17.40.
Makushtha	118.11.	
Madhuka	118.6, 179.10.	
Malli		6.102.
Madhvi	45.5.	
Masha	118.11	17.61, 68.21.
Mulaka	136.114.	
Mudga	118.11	16.41, 26.122, 54.12, 68.21.
Yava	14.15, 38.11, 63.5, etc.	17.59, 18.13, 68.21.
Yuthika		68.12.
Raktachandana	154.1	50.36.
Raktasali	118.9	17.39, 54.23.

Rudraksha	127.70.	
Rodhra	117.26.	
Raktasoka		6.17.
Rambha		39.6, 62.18, 64.5.
Rohita	84.3.	
Lakucha	84.6, 94.7.	
Vetasa		6.16.
Vidruma	1.23.	
Bilva	27.39, 63.6, etc.	
Sara		18.9.
Salmali		12.10.
Sarshap	99.4.	
Sriphala	17.58.	
Srivasa		17.36.
Sarola		58.9.
Siddhartheka		18.7.

Appendix XVI

Trees and Plants Patronised by the Mughals in their Gardens

(1) As listed in the Memoirs of Babur

Amla -- Myrobalan Tree — Phyllanthus.
Anbah -- Mango.
Ambli -- Tamarind.
Bodhal -- Monkey Jack.
Ber -- Lota Fruit.
Chikda -- Red Jujube.
Chirunji -- Buchanania Lotifolia.
Gular -- Custurd fig.
Jaman -- Eugenia Jambolana.
Jasun -- Hibiscus Rose Sinensis.
Kadhal -- Jack fruit.
Kamrak -- Averrhon — Carem boela.
Kamir -- Oleander — Nerium odorum.
Karaumda -- Cardina Carissa Carandos.
Kardi -- A kind of peach.
Kela -- Plantain.
Khirni -- Mimusops Kauki.
Khurma -- Date palm.
Kiura -- Screwpine — Pandanus.
Limu -- Lime — Citrus Acida.
Mahuwa -- Bassia Latifolia.
Naranj -- Orange.
Naryal -- Cocoanut palm.
Paniyala -- Flacourtia Cataphracta.
Qawun -- Musk-melon.
Sangtare -- A type of orange.
Tar -- Palmyra plan.
Tarunj -- Citron.
Yasmau -- Nasmine.

(2) Trees and Plants Mentioned in the Memoirs of Jehangir

Bid Malla -- Willow.
Chambeli -- Jasmine.
Champa -- Pagoda tree.
Chenar -- Oriental plane.
Keora -- Screwpine.
Katki -- Keora.

Mulasari	--	Mimusops Elengi.
Rae Bel	--	Jarmine.
Safider	--	White poplar.
Saru	--	Cypress.

(3) Trees and Plants Mentioned in Ain-i-Akbari

Bholsari	--	Mulasri.
Chaltah	--	Dillancia speciosa.
Chambali	--	Jasmine.
Champa	--	Michelia Champaca.
Gulal	--	Gulal is the red powder used during Holi Fev.
Gul-i-zafaran	--	Saffron.
Juhi	--	Jasmine Awicultum.
Kapur Bel	--	Camphor tree.
Karnah	--	A species of citron.
Ketaki	--	Paudanus odoratissinus.
Keora (Keoarah)	--	Screwpine.
Kuzah	--	A kind of rose.
Mogra	--	Marangaceae.
Nargis	--	Narcissus.
Niwari	--	Jasminum, Zambac.
Padal	--	Stereospermum suavolens.
Raibel	--	Jasminum Zambac.

Appendix XVII

List of Trees, Shrubs and Creepers Depicted in Kangra Paintings

Aguru	--	a large evergreen tree with fragrant heart wood.
Amaltas	--	a small hardy tree with pendulous racemes of large bright yellow flowers which blossom in April and May.
Arjuna	--	a large shady tree.
Asoka	--	a herald of spring, has scarlet crimson bunches of flowers in early March. Said to flower on the touch of a beautiful Women's feet.
Atimukta	--	a type jamine flower.
Bandhuka	--	Pentapetes phoenicia.
Betal	--	a climber, leaves used for chewing.
Bimba	--	a creeper with bright red fruit.
Champaka	--	a large tree commonly grown in temples with bright yellow fragrant flowers.
Devadaru	--	the Himalaya Cedar.
Gandharaja	--	shurb with highly fragrant white flowers.
Gunja	--	seeds used as jeweller's weights.

Gul Mohur -- an umbrella like tree with pinnate feathery leaves. It bears scarlet flowers in May.
Honey Apple -- a large round fruit.
Jasmine -- several varieties are mentioned, as *chameli* and others.
Jujube -- *beri*, small round fruits, favourite of children.
Kachnar -- a medium sized ornamental tree with drooping branches. It producess a rich harvest of mauve or white blossom in February-March.
Kadamba -- has ball like flowers in rains, favourite of Krishna.
Kandali -- an annual herb with blue purple flowers blossoming in the rainy season.
Karnikara -- a large tree with broad leaves.
Kasa -- a tall grass.
Kesara -- Saffron.
Ketaki -- a highly fragrant plant with spinous sword-like pointed leaves.
Kimsuka -- tree with crimson-flowers, a herald of spring.
Kovidara -- a small tree bearing pink flowers in November.
Kumuda -- a water lily with white flowers opening at night time, and closing during the day.
Kunda -- Jasmine.
Kurabaka -- also called *mehndi*, powder of leaves used for dyeing palms of hand.
Kutaya -- a small tree with white flowers.
Lavanga -- Vine - *Lavanga-lata*, a herald of spring.
Lodhara -- pollen used as a face powder in India.
Lotus and water lily -- Many varieties are mentioned.
Madhavi -- ascendant shrubby creeper, herald of spring and lover of mango tree.
Mahua -- a common shady tree in central India, an alcoholic beverage is distilled from its flowers.
Malati -- a twining shrub with fragrant white flowers.
Mandara -- a small tree with red flowers in leafless condition in early March.
Mango -- a tree of mango fruits.
Nagakesara -- a fruit tree of Eastern India with white flowers and yellow interior.
Narikela -- cocoanut palm.
Navamallika -- a shrubby palm.
Nim -- a shady tree flowering in March-April.
Padam -- wild cherry found in the temperate Himalaya at an altitude of 1000 to 6000 feet.
Parijataka -- drops its flowers early in the morning.

Patala	--	trumpet-flower, herald of spring.
Pipal	--	a large tree with glossy, dark-green, poplar-like leaves.
Pital	--	a yellow flower not identified.
Plantain	--	Banana tree having smooth straight stem, symbol of female beauty.
Priyangu	--	a shrub flowering in August.
Punnaga	--	a tree with glabrous leaves and fragrant white flowers.
Sala	--	a tall timber tree, associated with the birth of the Buddha.
Saptachchhada	--	a handsome tree.
Sandal	--	a small evergreen tree growing in Mysore, its heart wood is fragrant.
Sarja	--	sala, a large timber tree.
Sarson	--	an oilseed plant with golden yellow flowers.
Semal	--	silk cotton tree.
Salmali	--	silk-cotton tree.
Sirisha	--	fragrant, flowers in early rain.
Sisam	--	a deciduous tree with hard wood, principally found in sub-Himalayan area of Northern India.
Tala	--	Palmyra, round purple fruits, symbol of female charm.
Tamala	--	straight stem, dark fragrant leaves, symbol of Krishna.
Valuka	--	a dwarf tree, leaves highly fragrant, flowers during rains.
Yuthika	--	a jasmine with fragrant white flowers tinged with purple.

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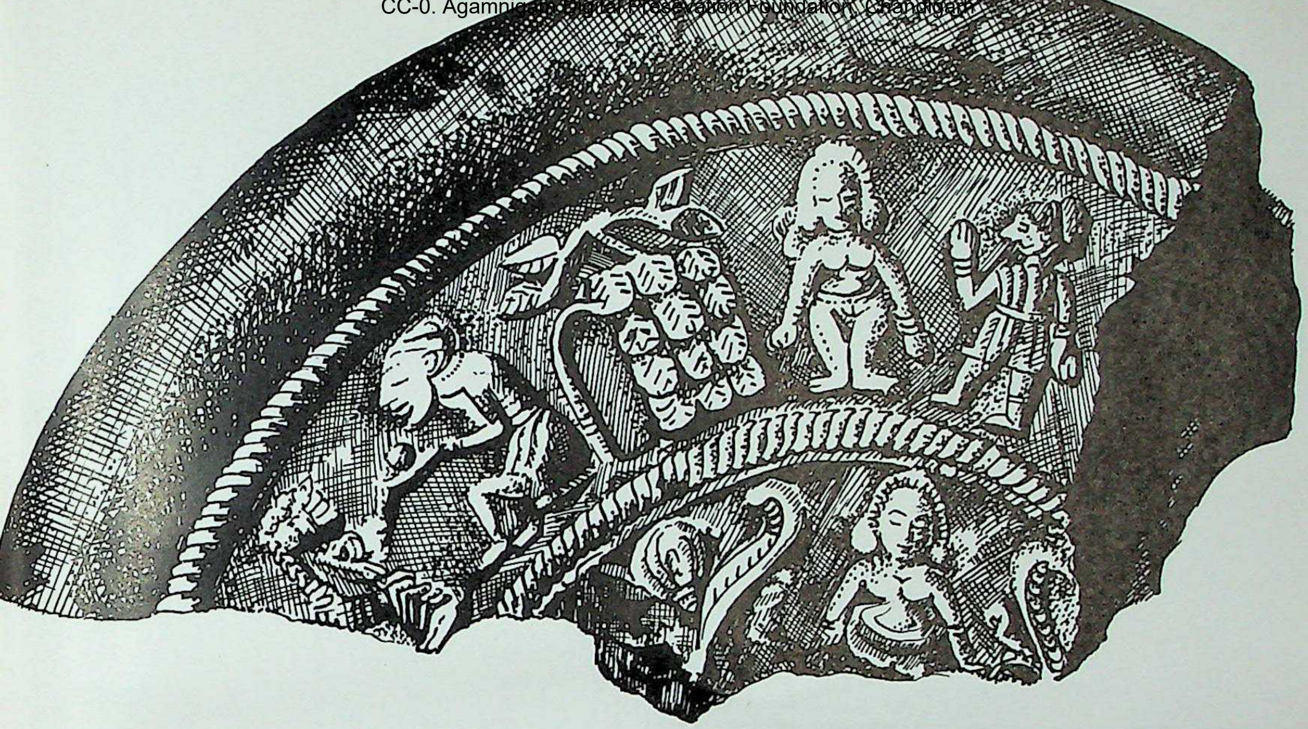
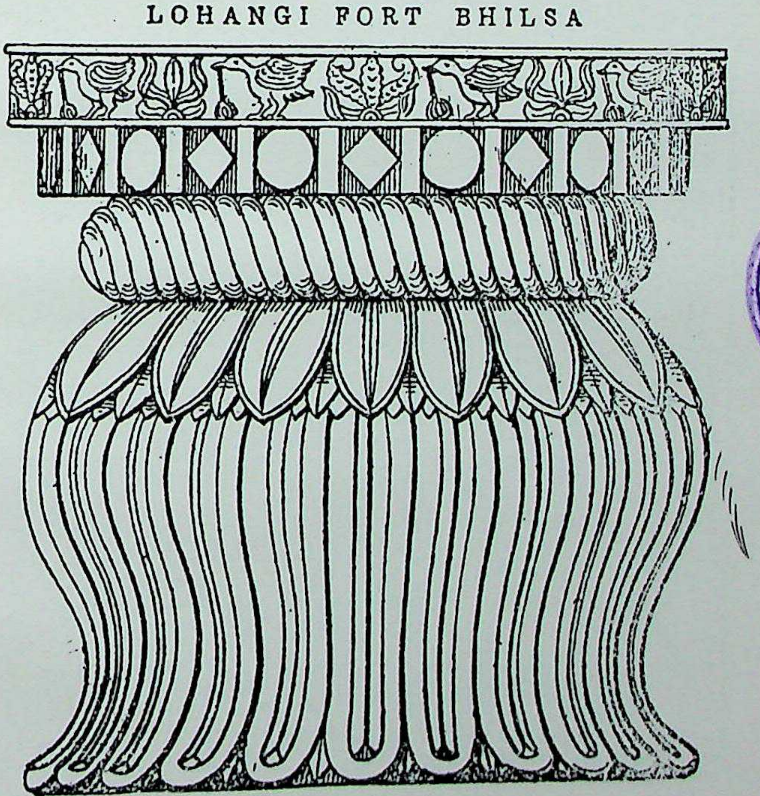


Fig. 1. Carved stone disc from Rupar, showing a lady standing in front of a leave's hut, under a tree; 600 B.C.



State Museum Library Lucknow 6454

Fig. 2. Base of lion capital from Lohangi fort, Vidisha, showing geese carrying lotus stalks in their beaks, Asokan period.

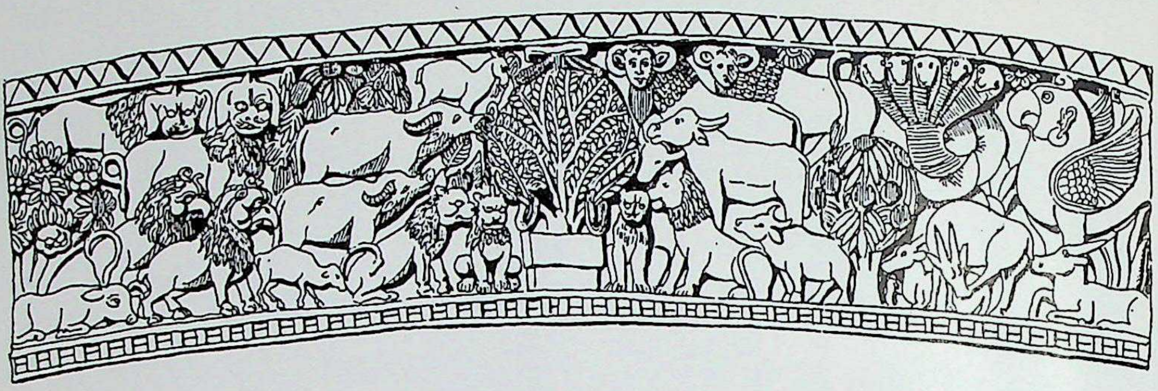


Fig. 3. Panel from Sanchi gateway showing the forest scene, with snakes and animals; 1st century B.C.

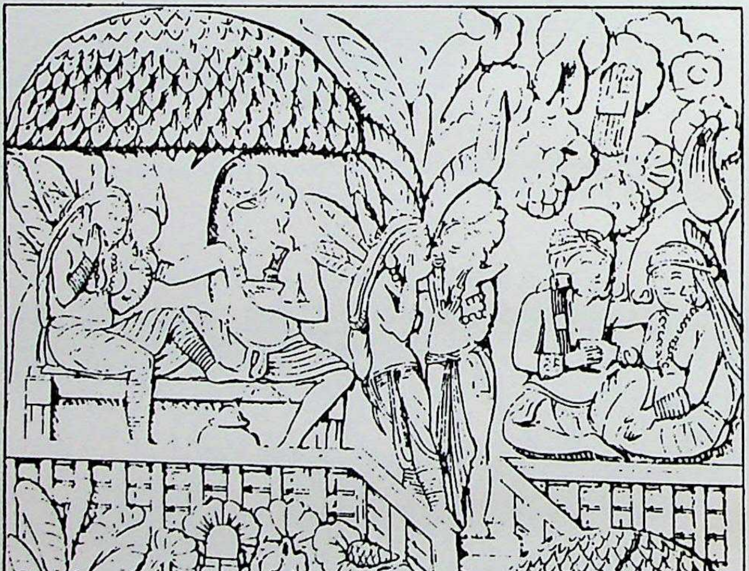


Fig. 4. Panel from Sanchi gateway showing a garden scene; 1st century B.C.

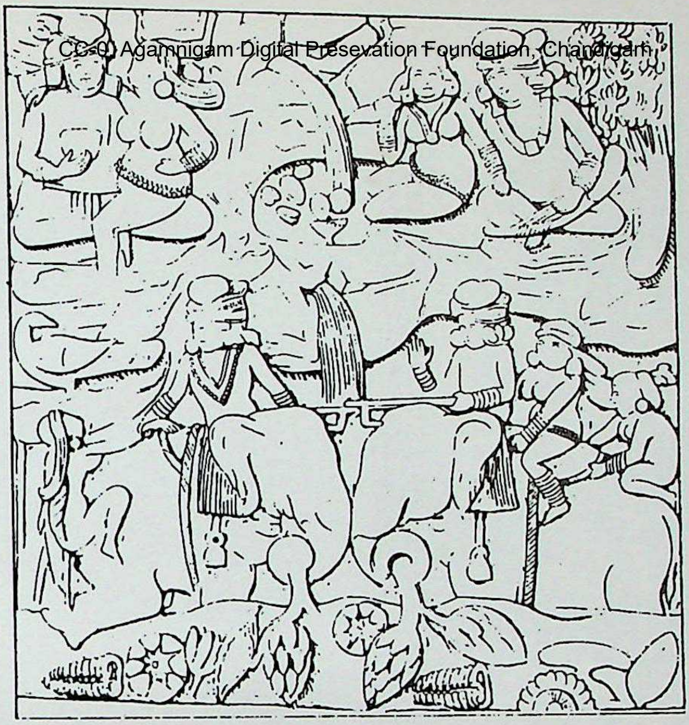


Fig. 5. Panel from Sanchi gateway showing a garden scene, 1st century B.C.

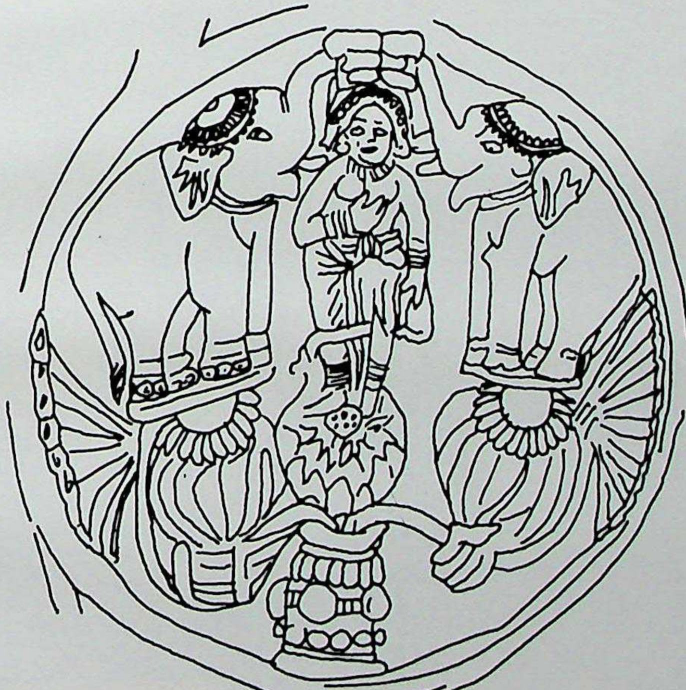
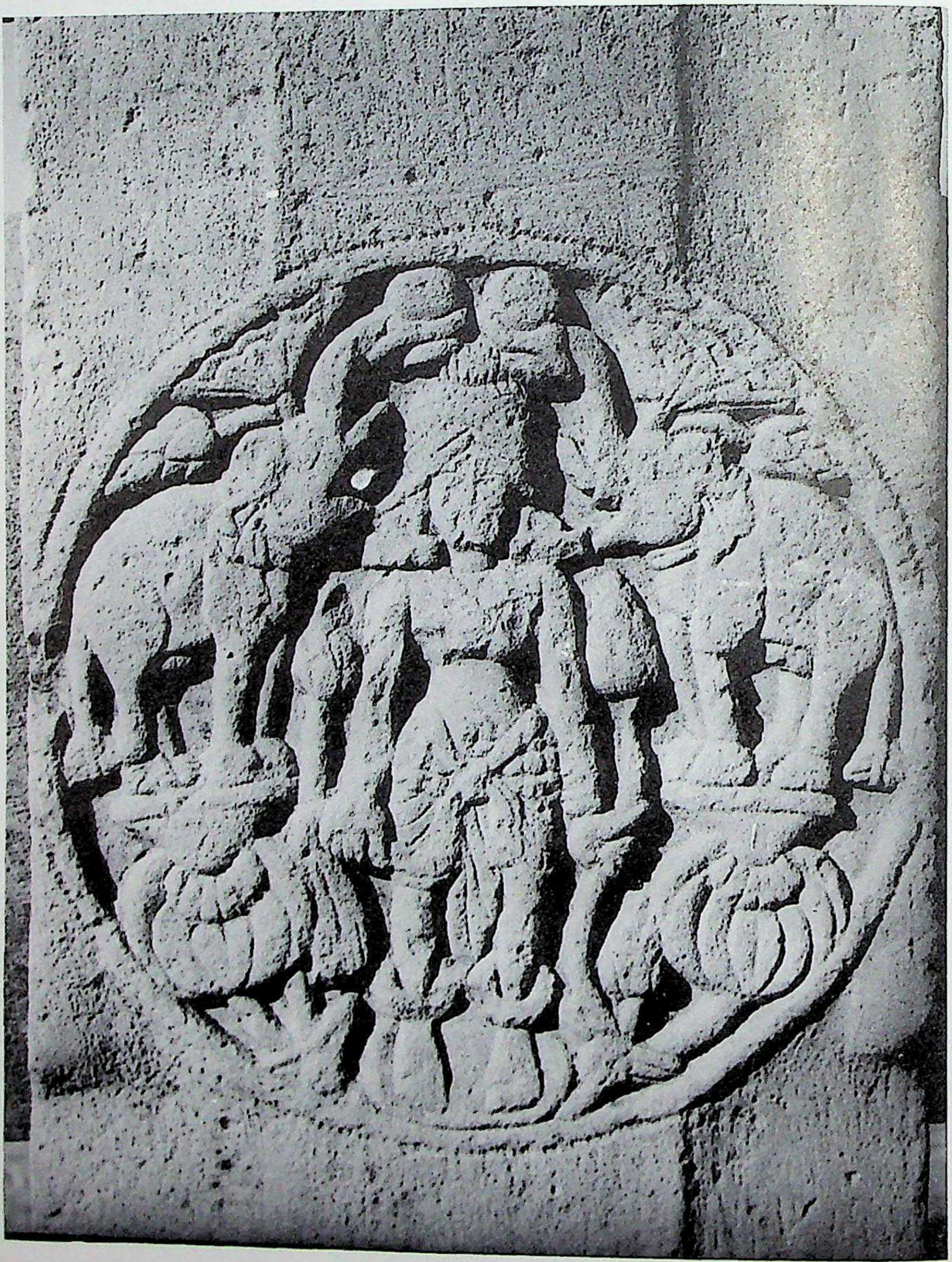
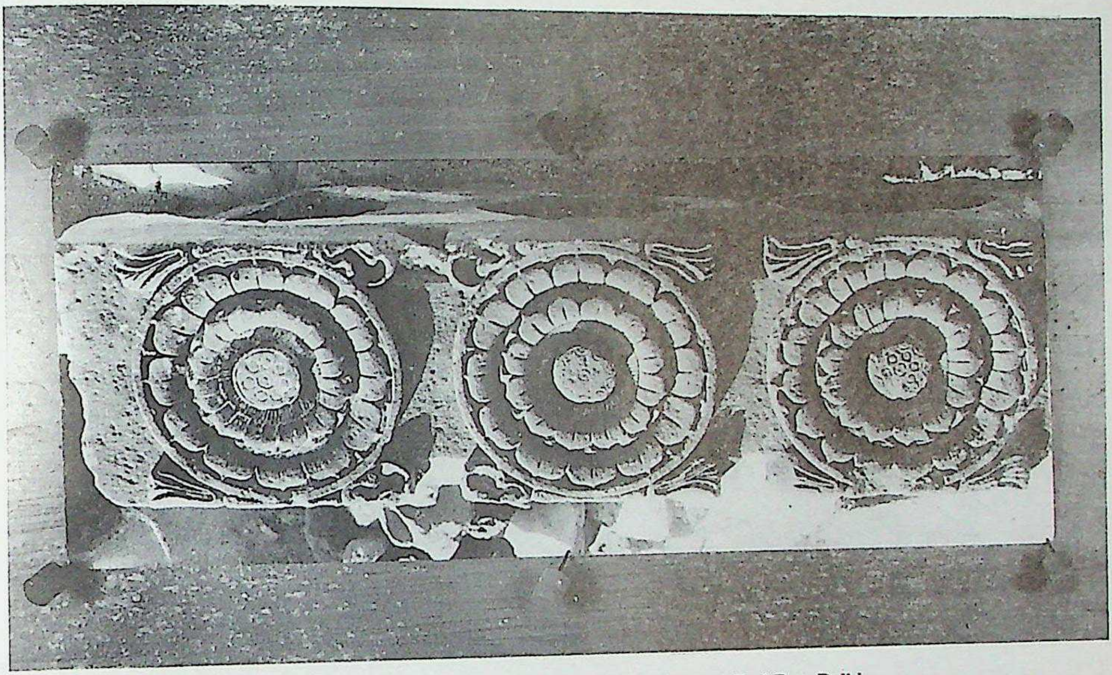

GUJALAXMI (BHARHUT, 2ND CENT. B.C.)

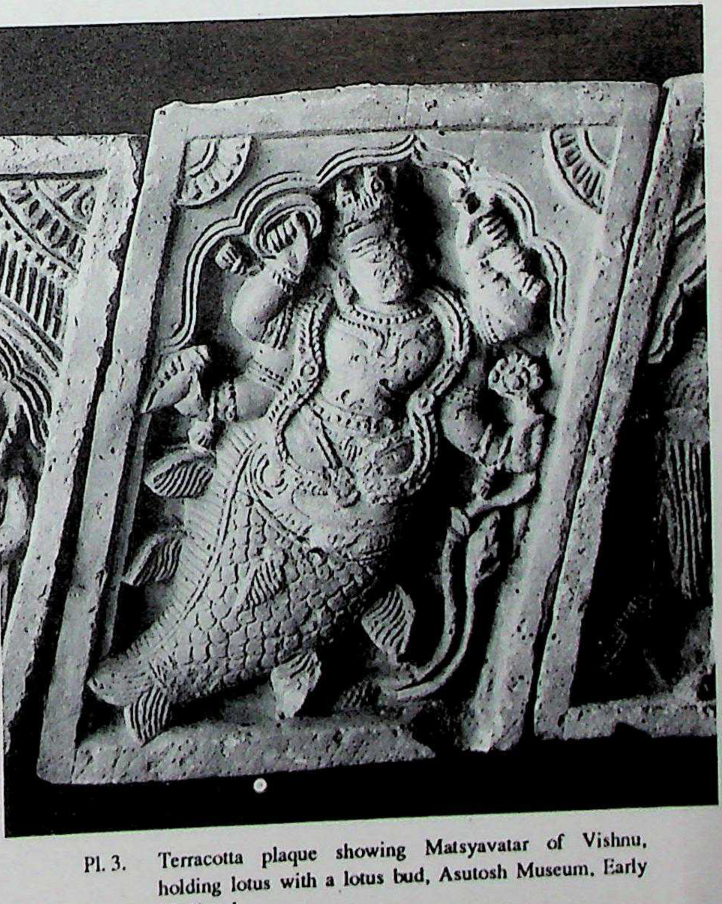
Fig. 6. Panel from Bharhut showing Gajalakshmi standing over a lotus and an elephant standing on lotus on either side pouring water over the Goddess 2nd century B.C.



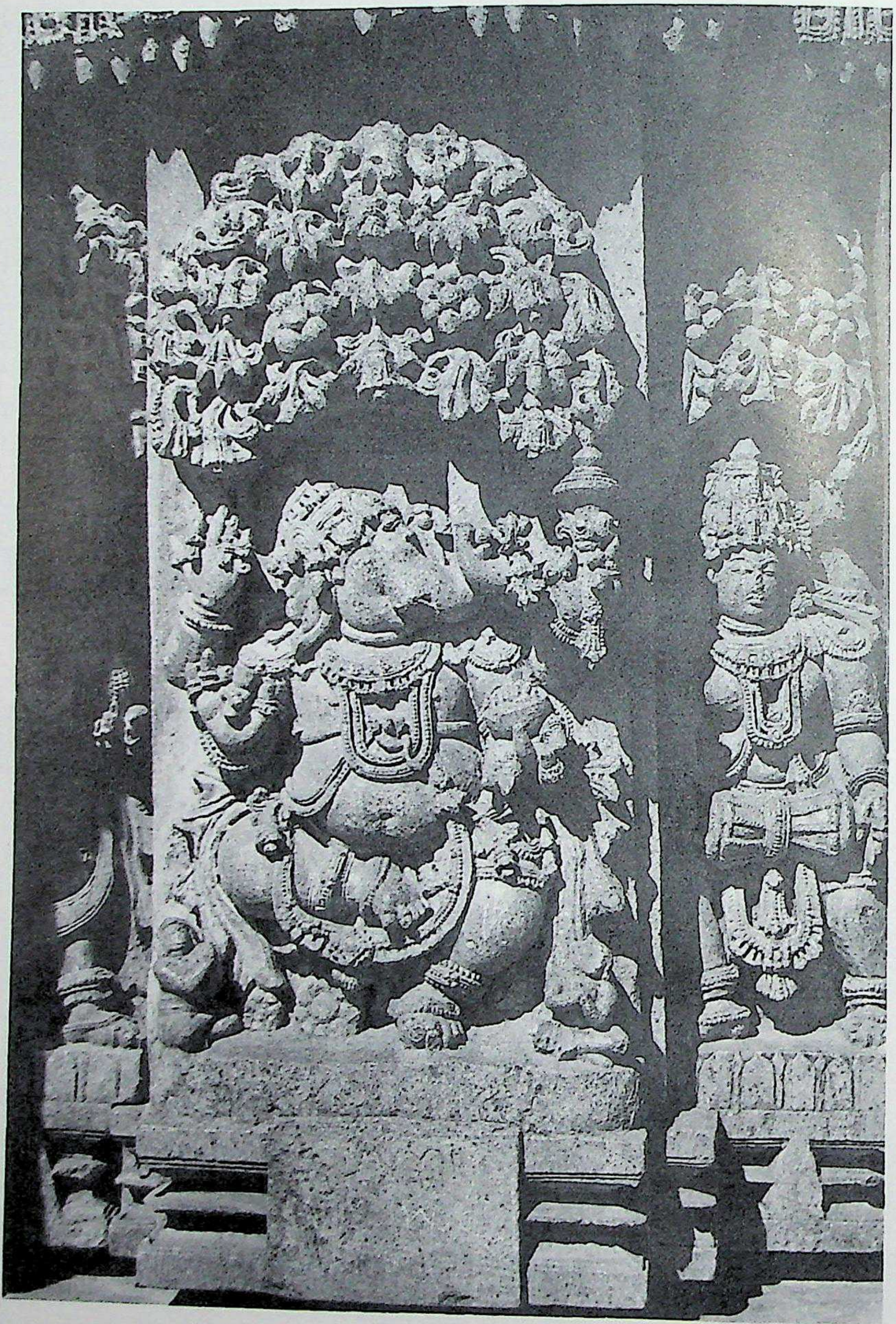
Pl. 1. Panel from Bharhut showing Gaja Lakshmi standing over a lotus, with an elephant on either side standing on lotus, pouring water over the goddess; Bharhut, 2nd century B.C.



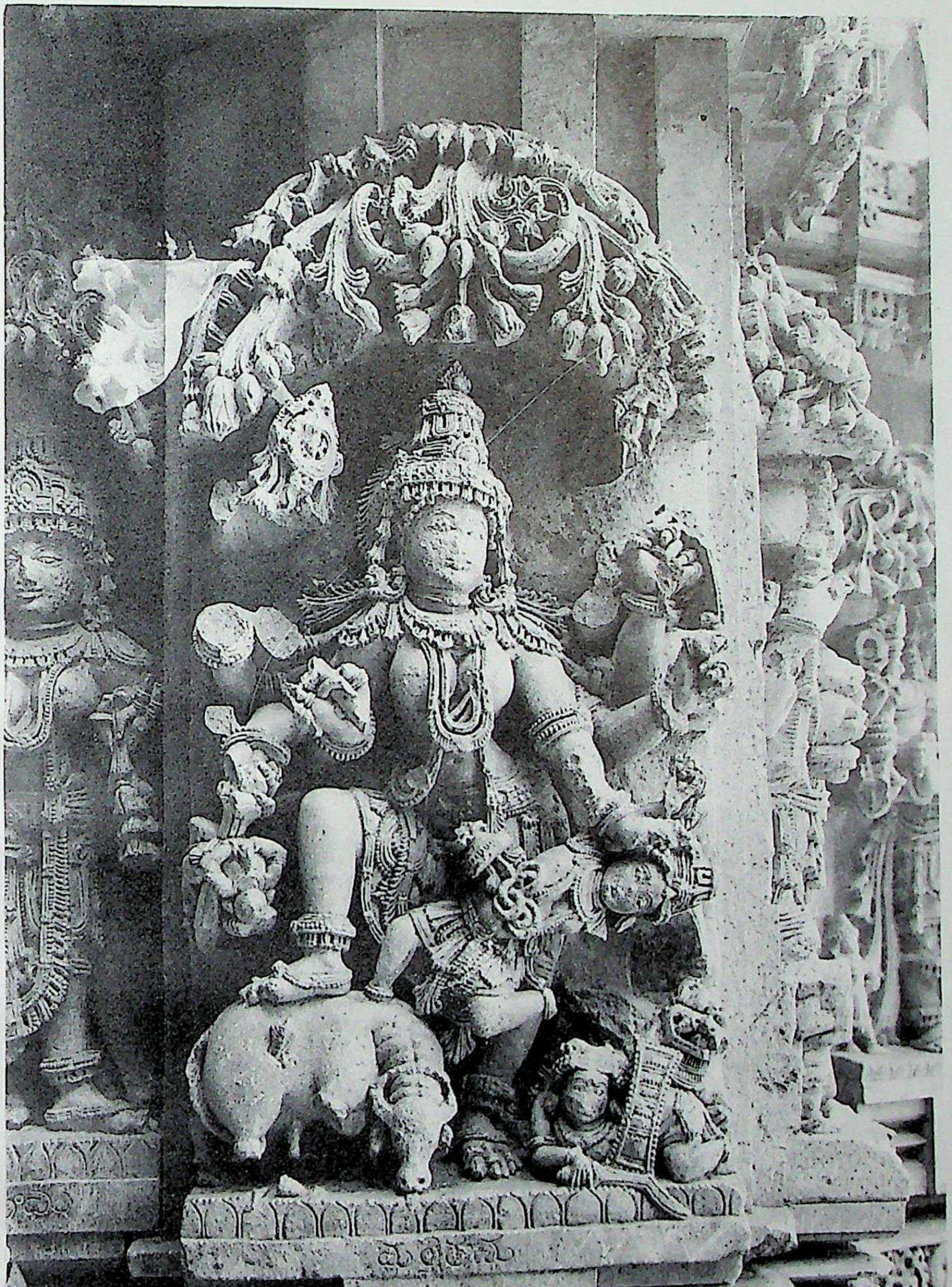
Pl. 2. Stone slab showing the fullblown lotuses, Red Fort, Delhi, Early Medieval.



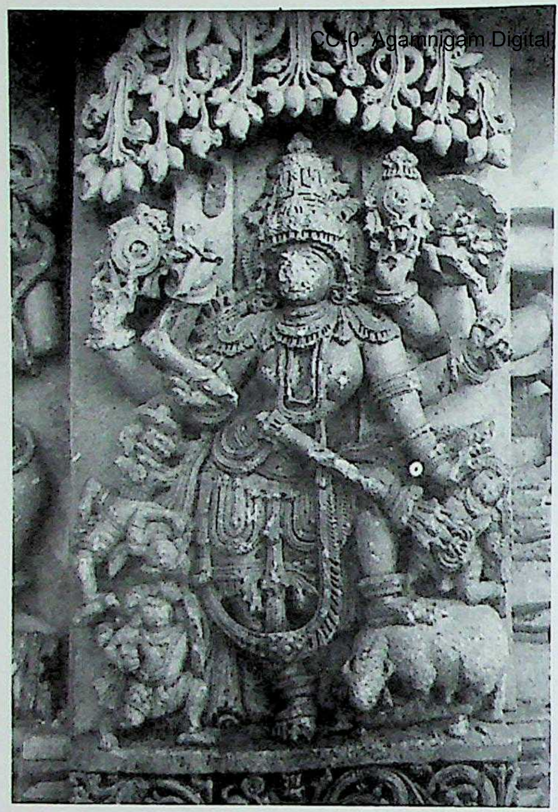
Pl. 3. Terracotta plaque showing Matsyavatar of Vishnu, holding lotus with a lotus bud, Asutosh Museum, Early Medieval.



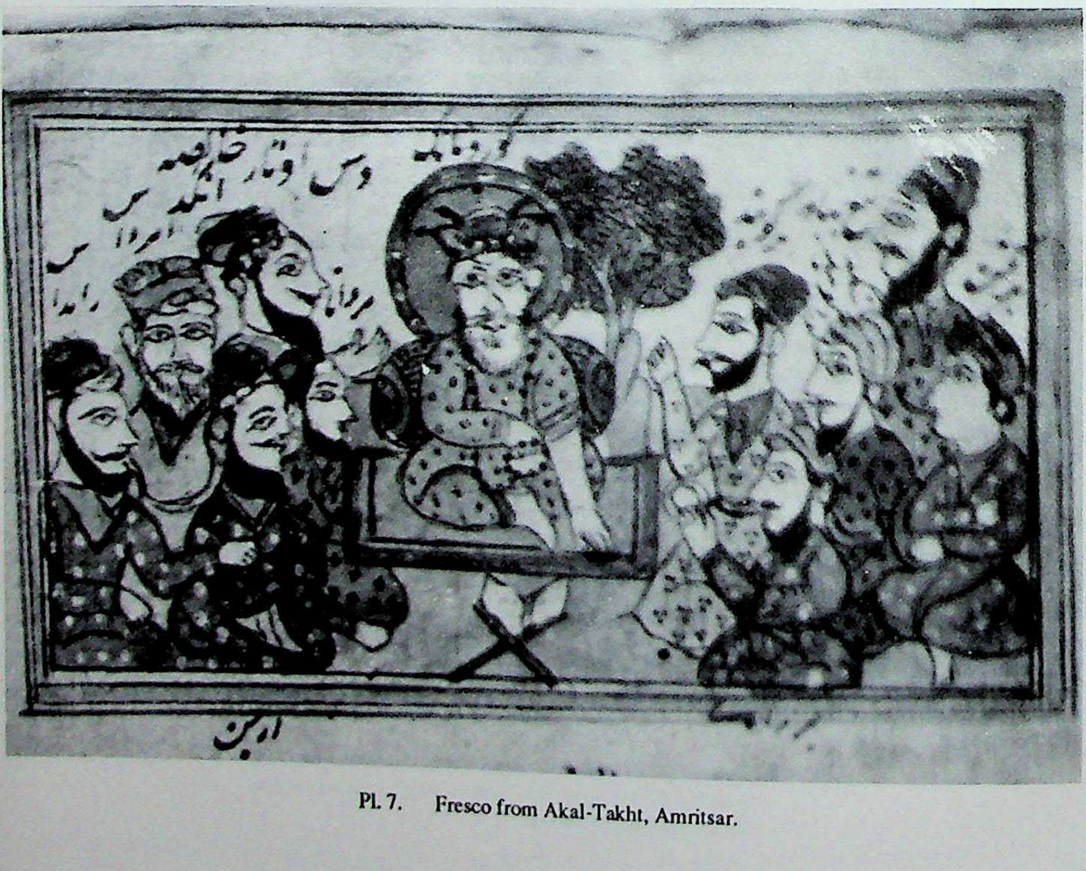
Pl. 4. Ganesa dancing under a tree full of fruites (mango), Kesava temple, Somanathapur, Medieval period.



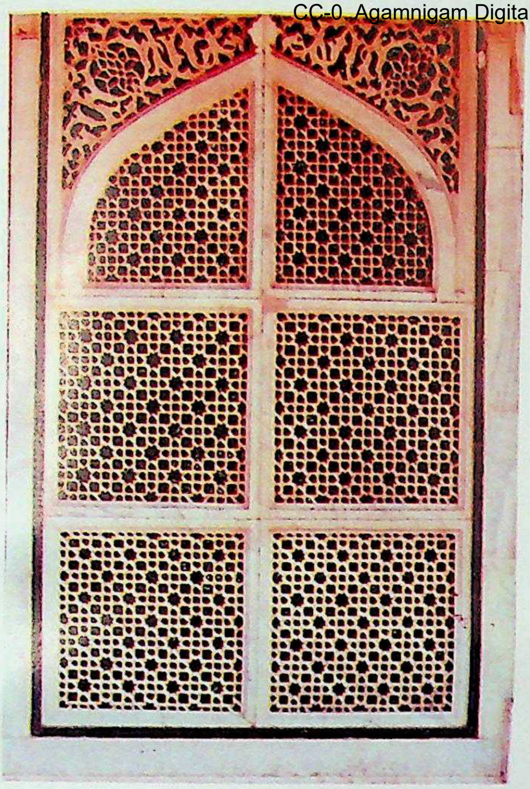
Pl. 5. Mahishasuramardini standing in *aligha* posture under the branches of a mango tree. Kesava temple, Somanathpur, Mysore, Medieval period.



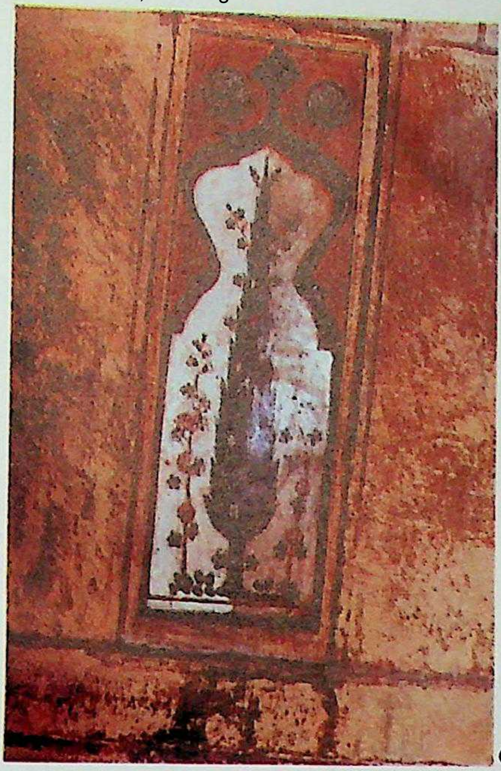
Pl. 6. Mahishasuramardini standing in *pratyalidha* posture under a mango tree, Nuggahalli, Mysore, Medieval period.



Pl. 7. Fresco from Akal-Takht, Amritsar.



C.Pl. 1



C.Pl. 2

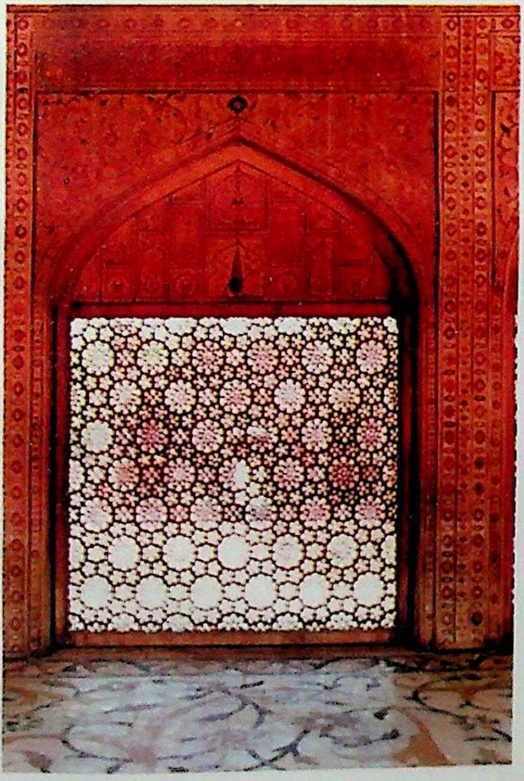
C.Pl. 1. Marble *Jali* work with flowery pattern at Dargah of Salim Chisti, Fatehpur Sikri, Agra. 16th century A.D.

C.Pl. 2. Inlay work in the tomb of Khusro, Allahabad, 16 century A.D.

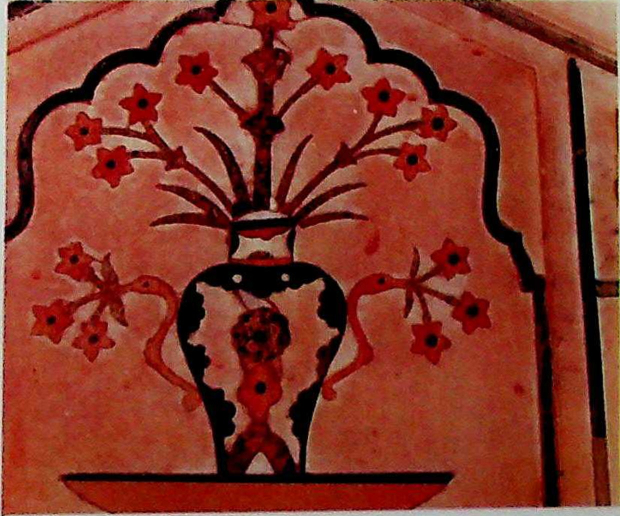
C.Pl. 3. Marble *Jali* work in the tomb of I'tmad-ud-Daula, Agra.

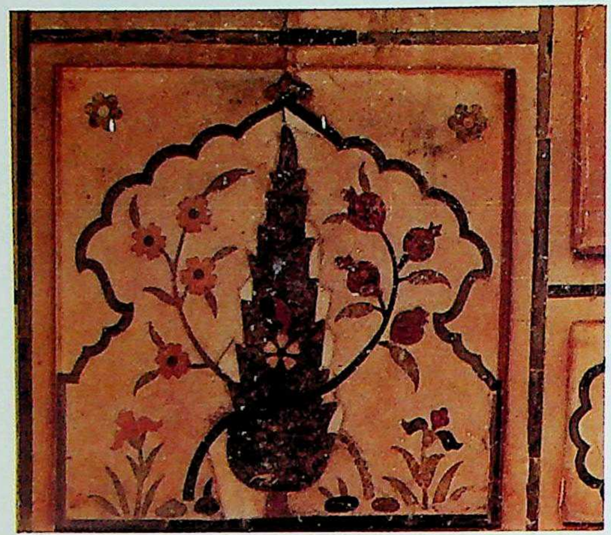
C.Pl. 4. Inlay work in the tomb of I'tmad-ud-Daula, Agra, showing Cypress.

C.Pl. 3



C.Pl. 4





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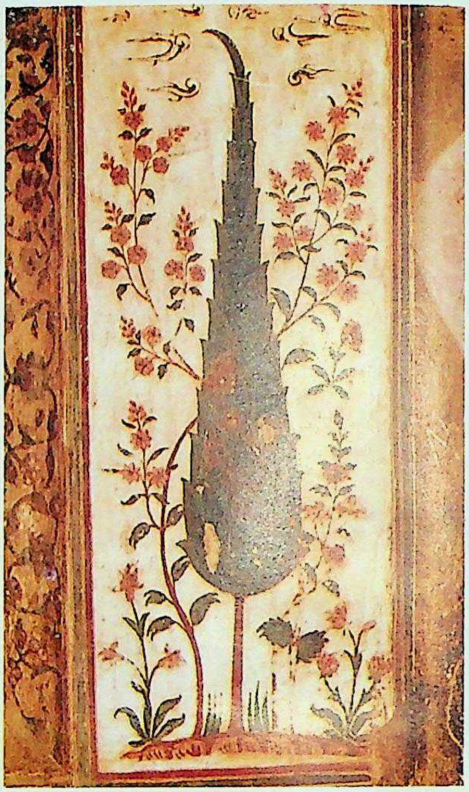


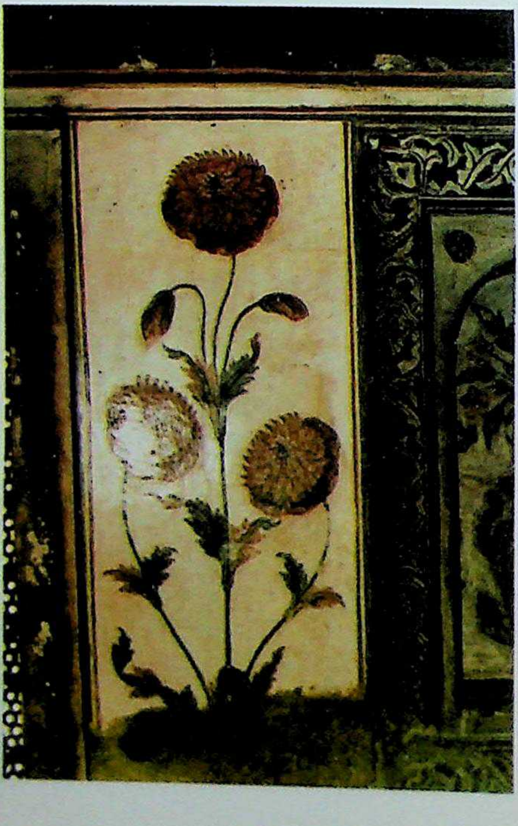
C.Pl. 6

C.Pls. 5, 6. Inlay work in the tomb of I'tmad-ud-Daula, Agra, showing Cypress.

C.Pl. 7. Inlay work in the tomb of I'tmad-ud-Daula, showing flowers and birds, Agra.

C.Pl. 8. Inlay work in the tomb of I'tmad-ud-Daula, showing flowers in a flower-vase fish-design, Agra.

C.Pl. 7



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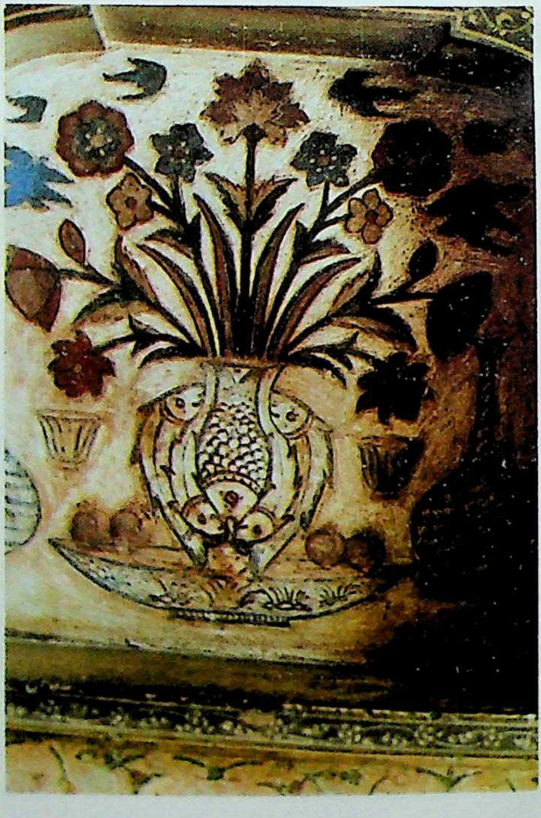
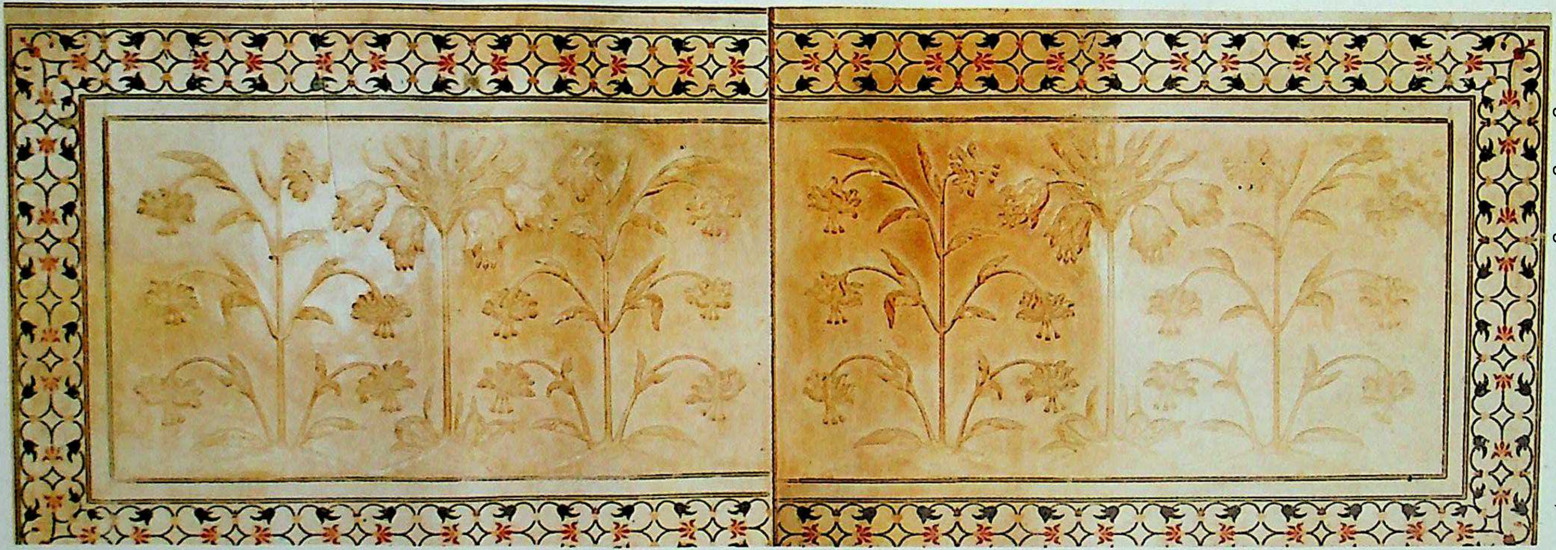
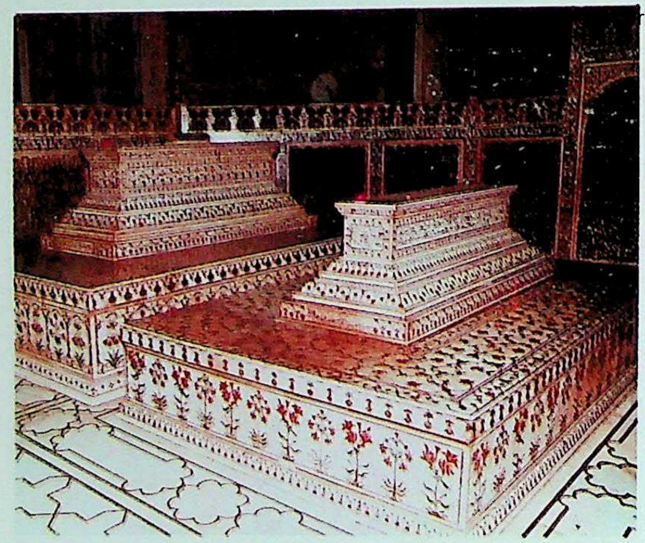
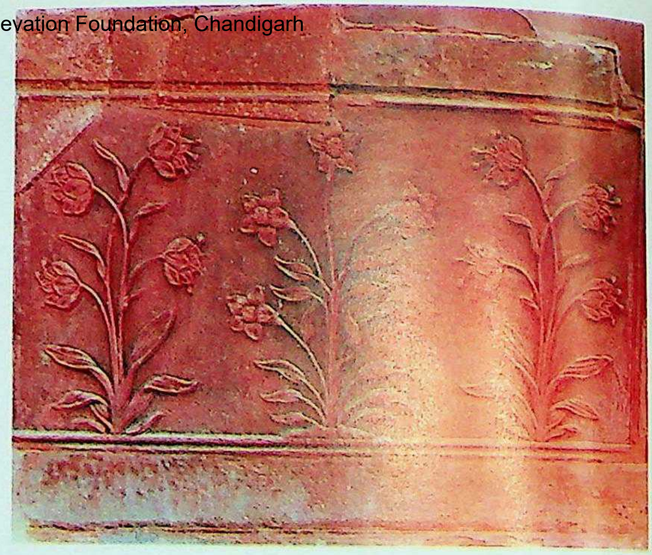




C.Pl. 9. Inlay work on the graves in the Taj, Agra.



C.Pl. 10



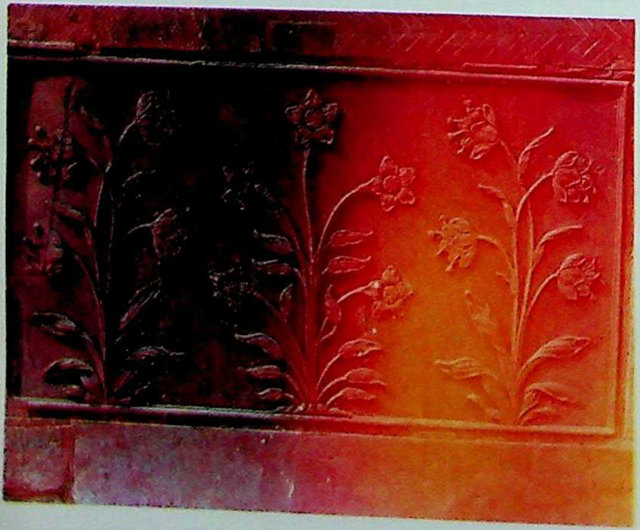
C.Pl. 11

C.Pl. 10. Inlay work on the graves in the Taj, Agra.

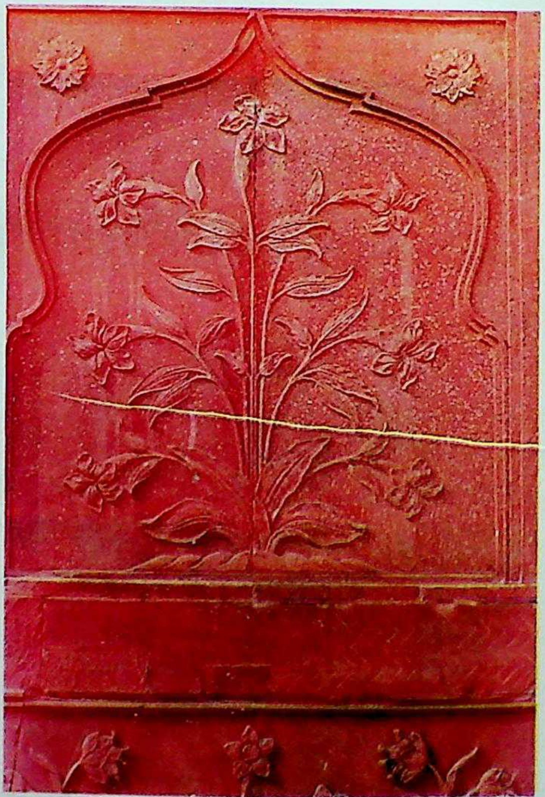
C.Pls. 11, 12. Flower patterns at Naubat-khana, Red Fort, Delhi.

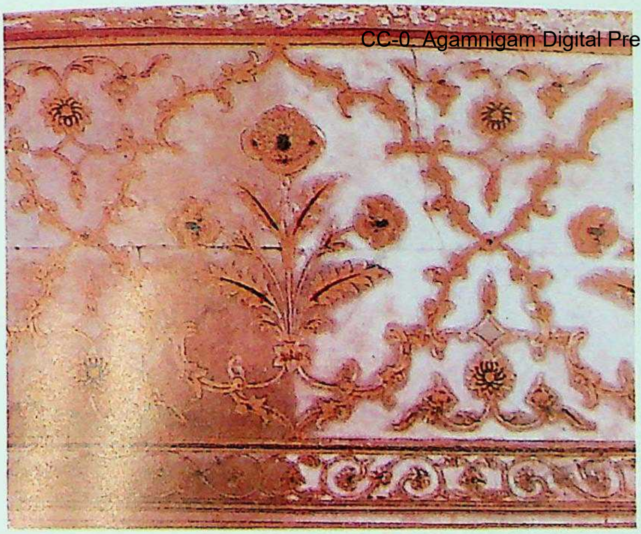
C.Pl. 13. Flower patterns at Naubat-khana, Red Fort, Delhi.

C.Pl. 12



C.Pl. 13





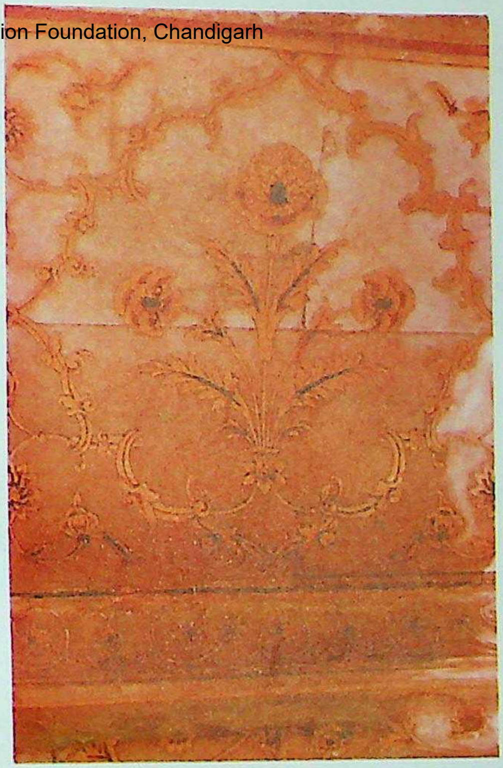
C.Pl. 14

C.Pls. 14, 15. Goden inlay work at Diwani-khas, Red-Fort, Delhi.

Goden inlay work at Diwani-khas, Red-Fort, Delhi.

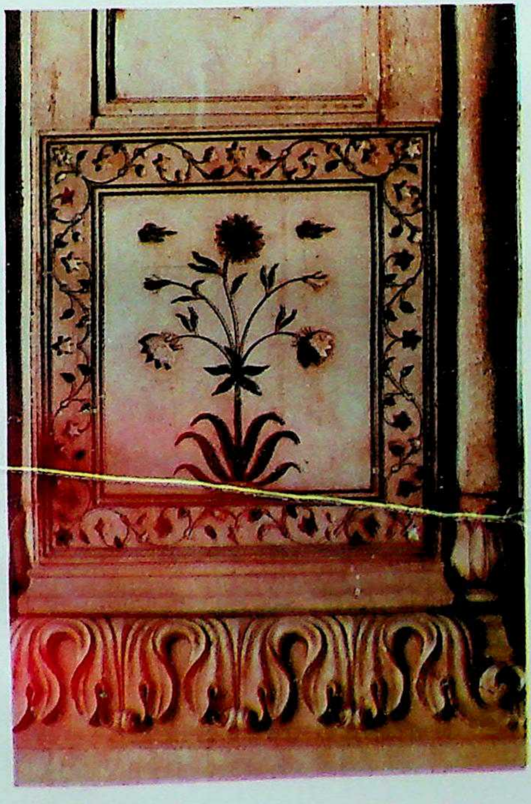
C.Pl. 16. Inlay work at Diwani-Khas, Red Fort, Delhi.

C.Pl. 17. Flora and fauna on the walls of Moti Masjid, Red Fort, Delhi.



C.Pl. 16

C.Pl. 15



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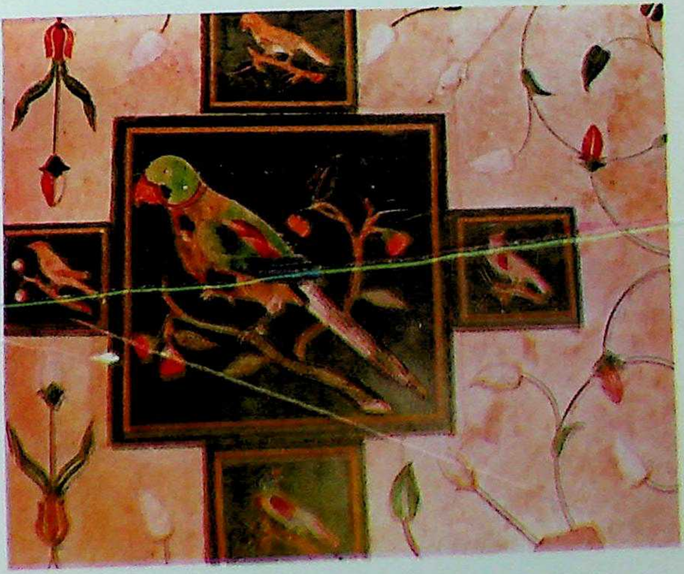
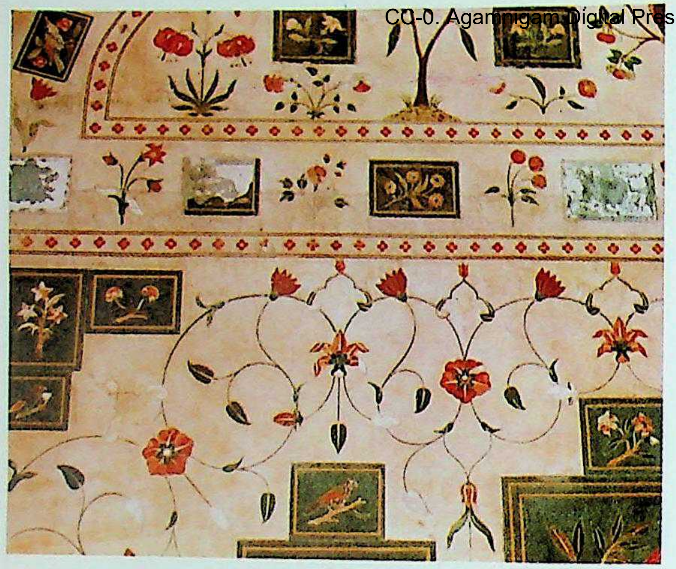
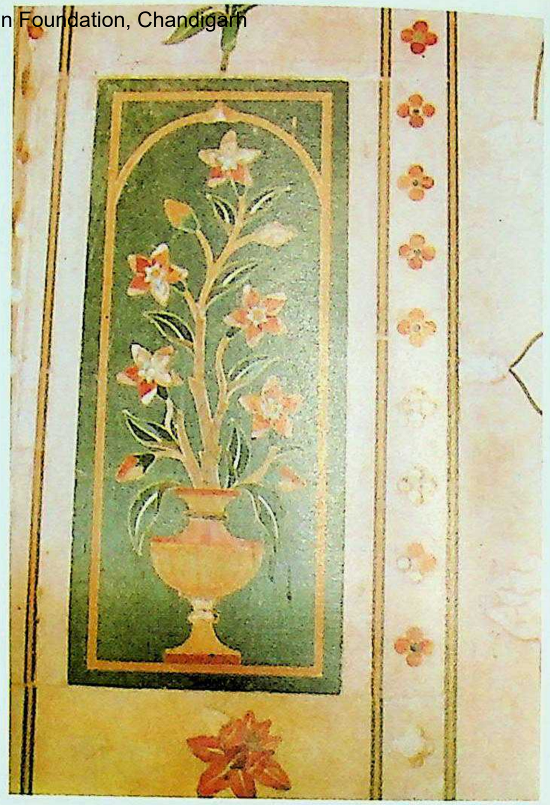




C.Pl. 18



C.Pl. 19

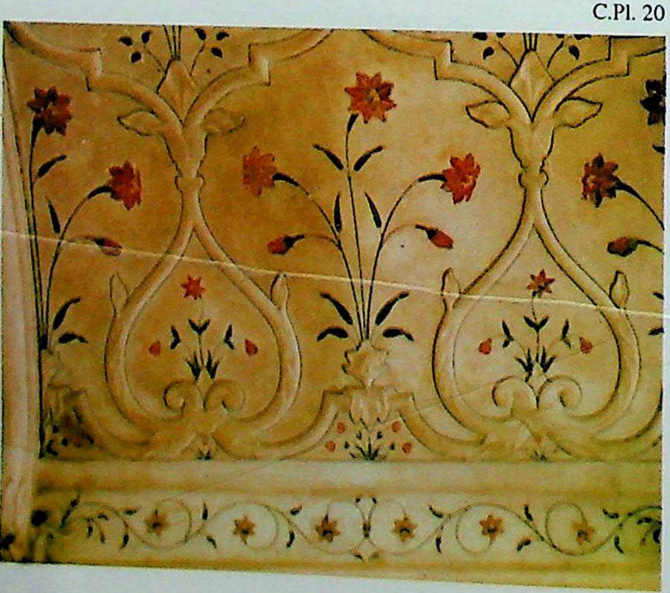
C.Pl. 18. Flora and fauna on the walls of Moti Masjid, Red Fort, Delhi.

C.Pls. 19-21. Inlay work at Moti Masjid, Red Fort Delhi, showing flowers.

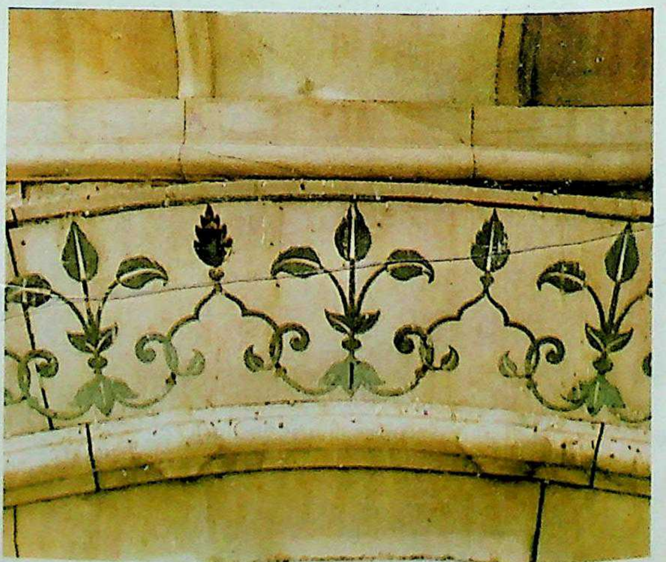
Inlay work at Moti Masjid, Red Fort Delhi, showing flowers.

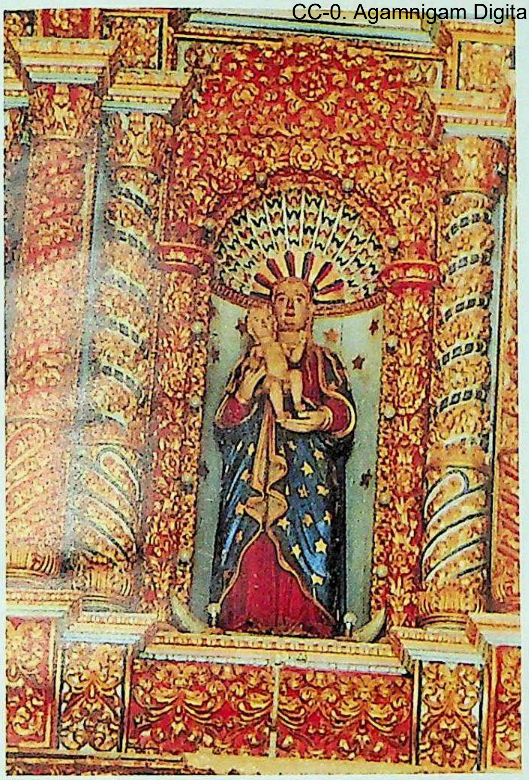
Inlay work at Moti Masjid, Red Fort Delhi, showing flowers.

C.Pl. 20

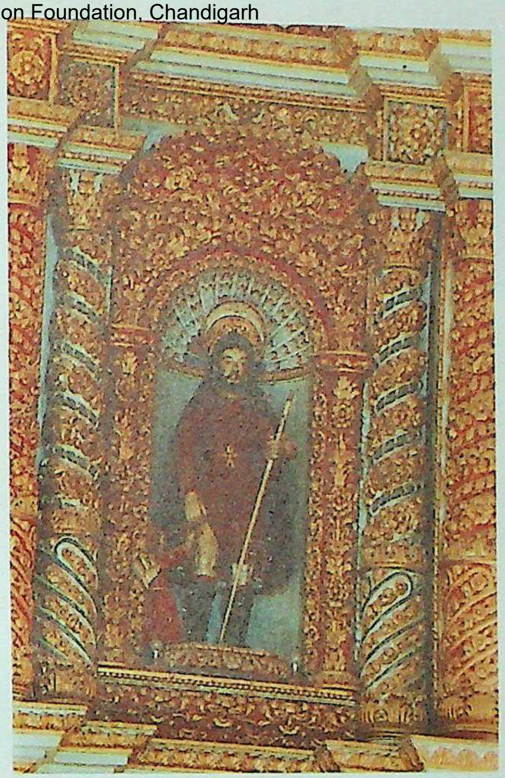


C.Pl. 21





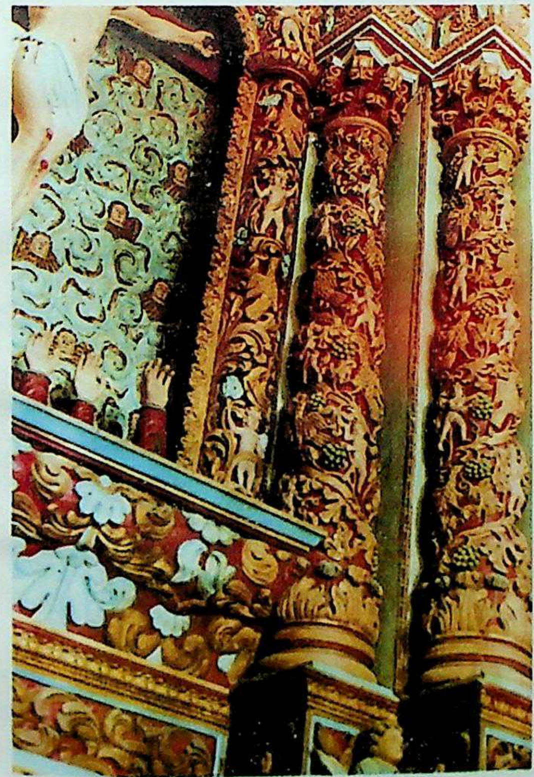
C.Pl. 22



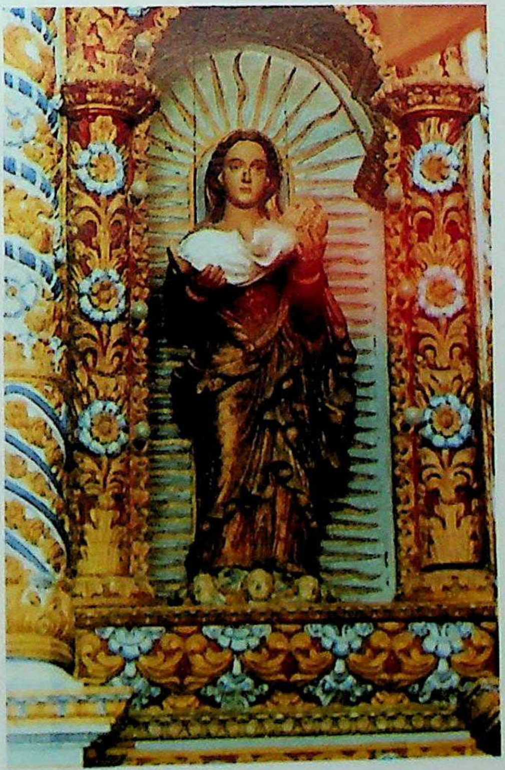
C.Pl. 23

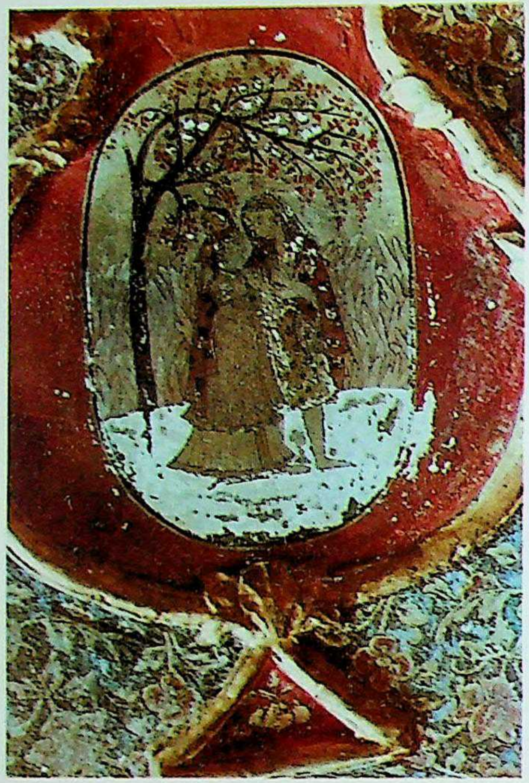
C.Pls. 22-25. Decorated interior of the Dally Jesus Church, Daman.

C.Pl. 24

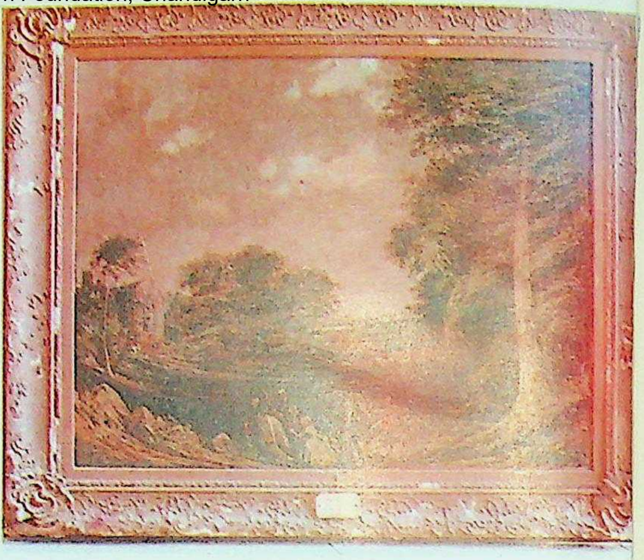


C.Pl. 25





C.Pl. 26



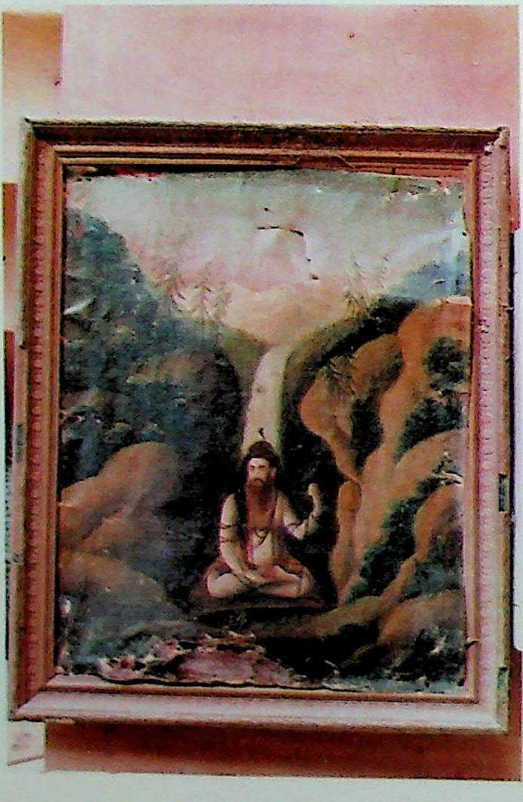
C.Pl. 2

C.Pl. 26. Siva and Parvati standing under a tr
Narbadesvara temple, Tirasujanpur.

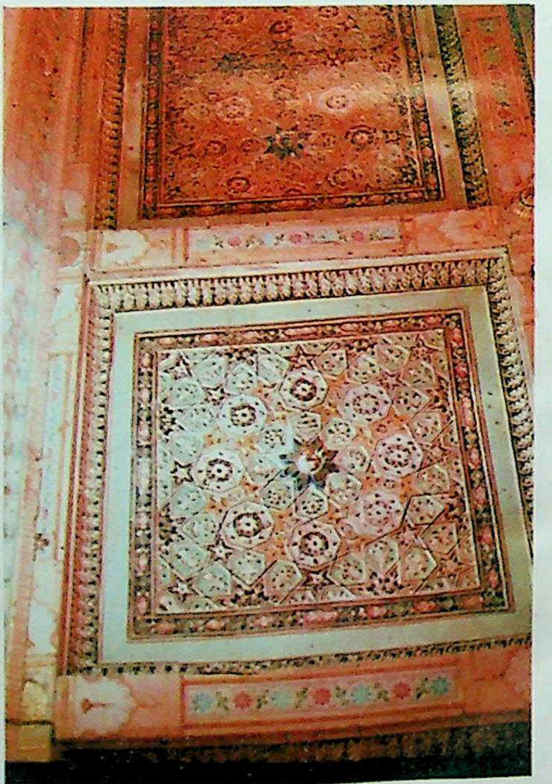
C.Pls. 27,28. Painting from Hazardwari Palace, Murshidabad

C.Pl. 29. Rolay Palace, Patiala

C.Pl. 28



C.Pl. 29



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